

Final 19  
Bureau 1994

# BEST



IES Data Report  
1992-1994



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# BEST DATA REPORT

## IES/PIES/XBT Data

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## I. INTRODUCTION

The BEST (Benguela Sources and Transport) Program was designed to measure the transport of the Benguela Current, monitor its variability and determine its origins as well as the ratio of the Agulhas Current and South Atlantic Current source water masses (A.L. Gordon, S.L. Garzoli and D. Pillsbury, Co PIs). In order to achieve the objectives, an extensive field experiment was organized and three cruises were completed during the years 1992 -1994:

**BEST 1:** R/V Africana July 16 to July 5, 1992. Geoff Bailey (SFRI, South Africa) and Silvia L. Garzoli (LDEO,U.S.)

**BEST 2:** R.R.S. Discovery, May 7 to June 3, 1993. Arnold L. Gordon (LDEO, U.S.)

**BEST 3:** R/V Maurice Ewing, October 24 to November 11, 1993. Silvia L. Garzoli (LDEO, U.S.)

The transport of the Benguela Current and its variability was measured by a moored array of inverted echo sounders, bottom pressure gauges and current meters. The instruments were deployed during the BEST 1 cruise and recovered during BEST 3. To study the ocean response to the local forcing, two of the IES were equipped with an ambient noise detector (ANSL). An intensive hydrographic work was carried out during BEST 2 to determine the water sources. In addition, CTD and XBT measurements were obtained during the other cruises to obtain 3 different realizations of the water column characteristics along the line of deployments and to conduct eddy search surveys. CTD work during the BEST 1 and 3 cruises was conducted by South African scientists Chris Duncombe-Rae, Frank Shillington and Geoff Bailey.

This data report includes the data collected with the IES, PIES and ANSL as well as the XBT survey conducted during BEST 3. The location of the instruments recovered during BEST 3 are given in Table 1 and Figure 1.

### *Inverted Echo Sounders (IES)*

The inverted echo sounders are bottom deployed instruments that internally record the time it takes for an acoustic signal to travel to the surface, reflect and return. It has been demonstrated (Watts and Rossby, 1977) that this time, called travel time, can be scaled to the dynamic height of the ocean. Examples of calibration of similar instruments deployed in the South Western Atlantic can be found in Garzoli and Garraffo (1989) and Garzoli (1993).



### ***Pressure Sensors***

The IES is a good detector of the baroclinic oceanic variability. In order to obtain the total transport, some of the IES were equipped with a bottom pressure sensor to measure and monitor both the baroclinic and barotropic component.

### ***Ambient Noise Detectors***

Two of the IES were equipped with a capability to detect and register the noise in the water column. This noise has been proven (Lemon et al, 1984) to be related to the magnitude of the wind stress at the surface. Examples of calibration and interpretation of the ANSL data in the South Western Atlantic can be found in Garzoli and Clements (1986) and Garzoli and Giulivi (1994).

### ***Expendable Bathythermographs (XBT)***

Ninety-three expendable bathythermographs were launched during BEST 3. Table 2 shows the location, date, time and surface temperature for each record. Location of the launchings is also shown in Figure 1. Part of the survey was designed to study the characteristics of an eddy detected with its center at approximately 36°20'S 10° 30'E.

## **II. DATA REPORT**

This report consists of four parts:

### **Part 1: Travel Time Series and Spectra**

In this part the travel time data collected with the IES are presented as follows:

- Figure 1: A map showing the location of the recovered instruments in top of the XBT launches during BEST 3.
- Table 1: The Table shows the coordinates and depth of the deployments as well as the dates of deployment and recovery;
- Time series of travel time and power spectra of the series. Time sampling is one hour.

### **Part 2: Bottom Pressure Series and Spectra**

The time series of the bottom pressure collected at the locations shown in Figure 1 and Table 1 are presented as follows:

- Time series of the original data (time sampling, 1 hour);
- Time series of the original data filtered from the tidal signal;
- Power density spectra of the original series.





### **Part 3: Ambient Noise Series and Spectra**

In this section the data collected with the ambient noise cards is presented as:

- Time series of ambient noise (time sampling, 1 hour);
- Power density spectra;
- Variance preserving spectra.

### **Part 4: XBT Data from BEST 3 Cruise**

The XBT data collected during the Best 3 cruise is presented as follows:

- Table 2: Coordinates, dates and surface temperatures of the launches;
- Plots of the vertical profiles as a function of depth.

### ***Acknowledgments***

Miguel Macció was the engineer in charge of preparing, deploying and recovering the instruments. He was assisted by Marcela Stern. Anthony Martino, together with Miguel Macció performed the data reduction. Miriam Colwell assisted with the preparation and publication of this data report. We are indebted to the crews of the R/V Africana and Maurice Ewing for their cooperation and technical support during the deployment and recovery cruises. We thank the Government of South Africa for granting permission to work in their territorial waters. The data was collected and reduced under NSF grant OCE 91-02722. The data report was supported by NSF grant OCE-94-01950. This is a Lamont-Doherty Earth Observatory Publication LDEO-94-1.

### ***References***

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# BEST

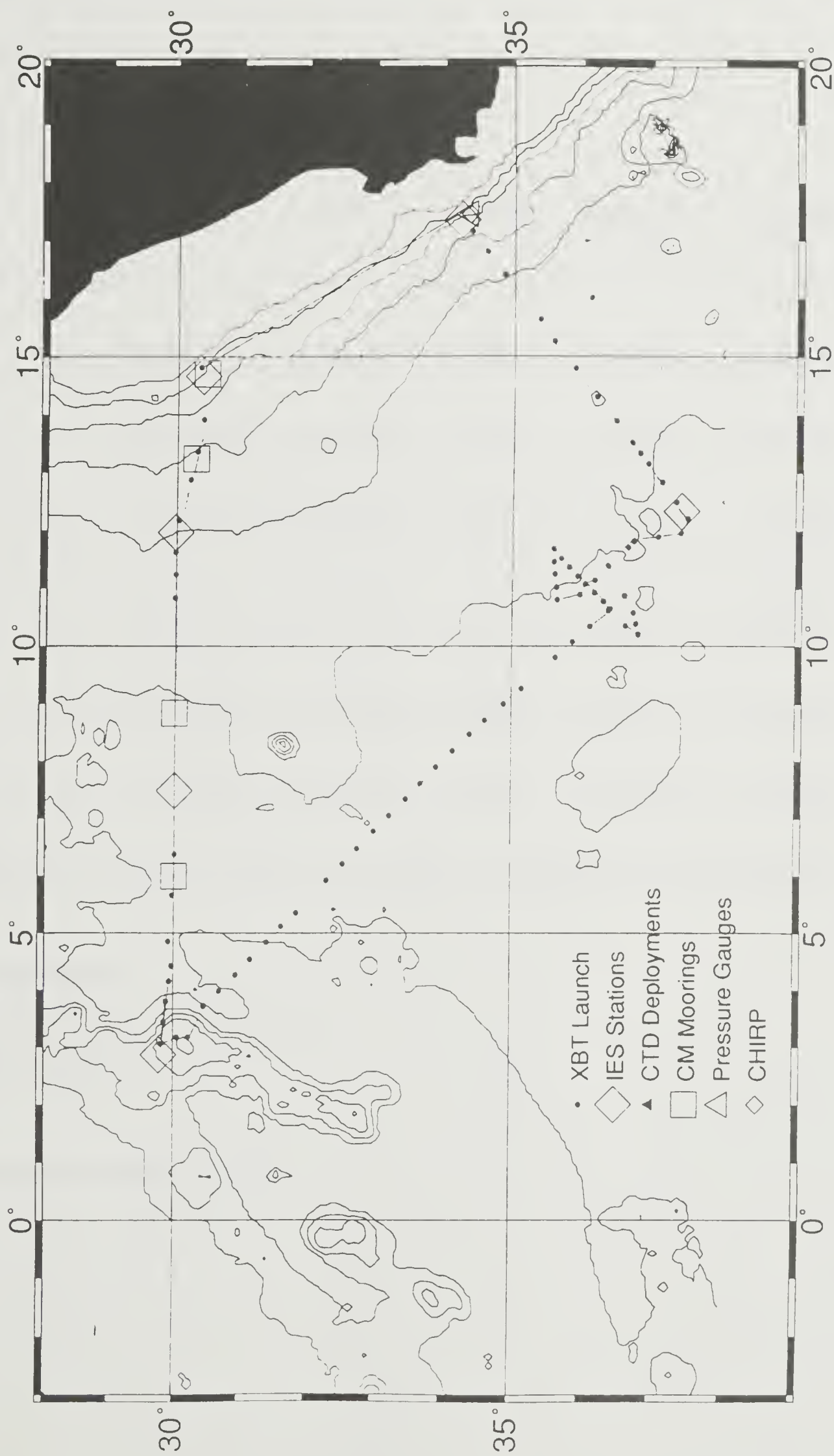


Figure 1: Location of the instruments recovered during BEST 3 and XBT survey.





# TABLE I

Instrument	S/N	LAT	LONG	Depth (m)	Deployment Date	Recovery Date
PIES	62	30°39.50'S	14 °40.13'E	980	6/18/92	10/26/93
PIES	50	29°59.32'S	11°58.32'E	3941	6/20/92	10/27/93
PIES	58	30°00.41'S	07°29.81'E	5173	6/22/92	10/29/93
PIES	61	29°47.28'S	02°52.48E	2600	6/25/92	10/30/93
IES/ANSL	59	37°24.96'S	12°20.9'E	5002	6/29/92	11/4/93
IES/ANSL	56	34°14.83'S	17°21.18'E	1926	7/3/92	11/9/93

*Location of the instrument sites (LAT, LONG), depth and dates of deployment and recovery are given*

IES: Inverted echo sounder

PIES: Inverted echo sounder with pressure sensor

ANSL: Ambient noise detector

Original sampling for all series:  $\Delta t = 1$  hour

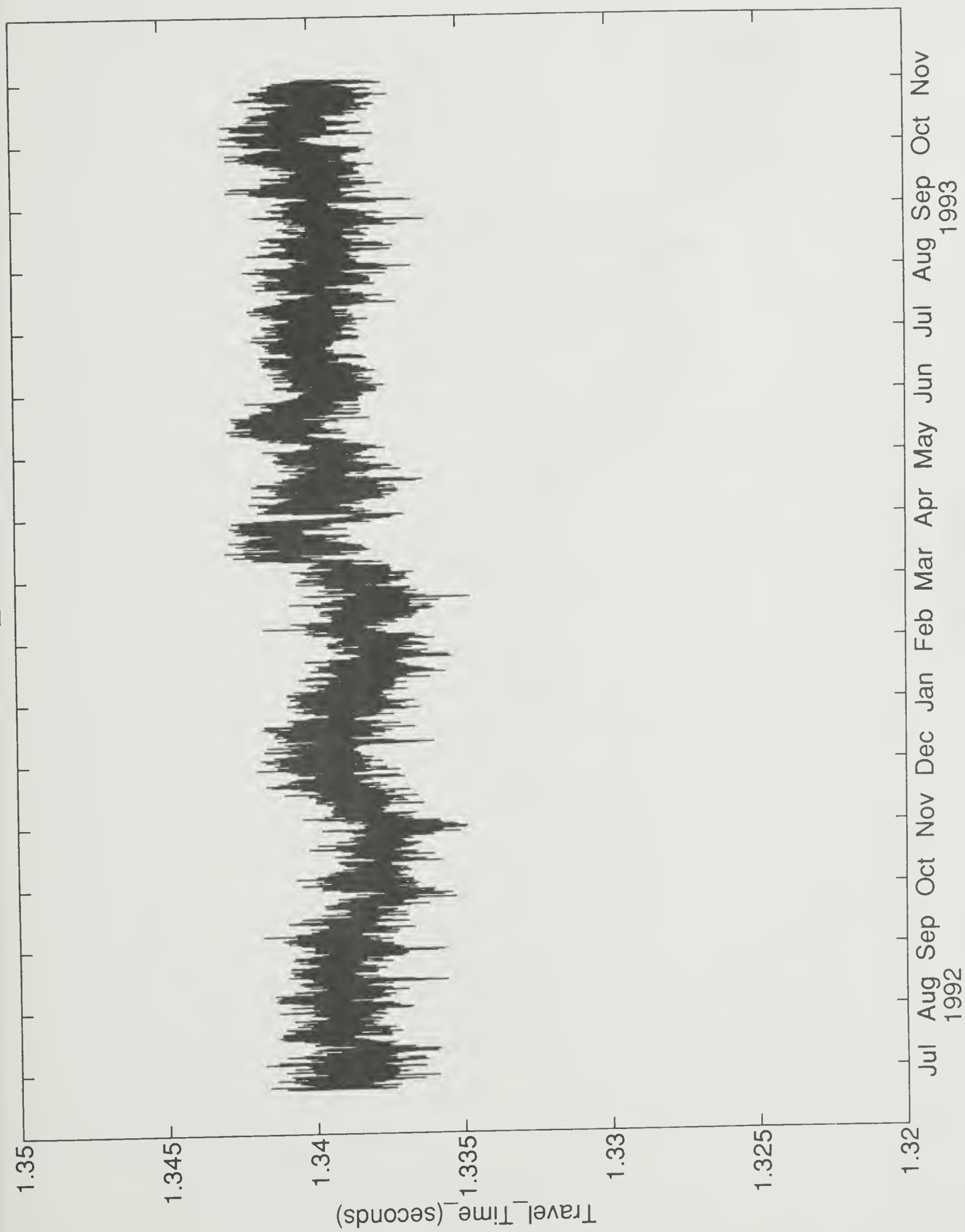


**Travel Time Series**  
**and**  
**Power Spectra**

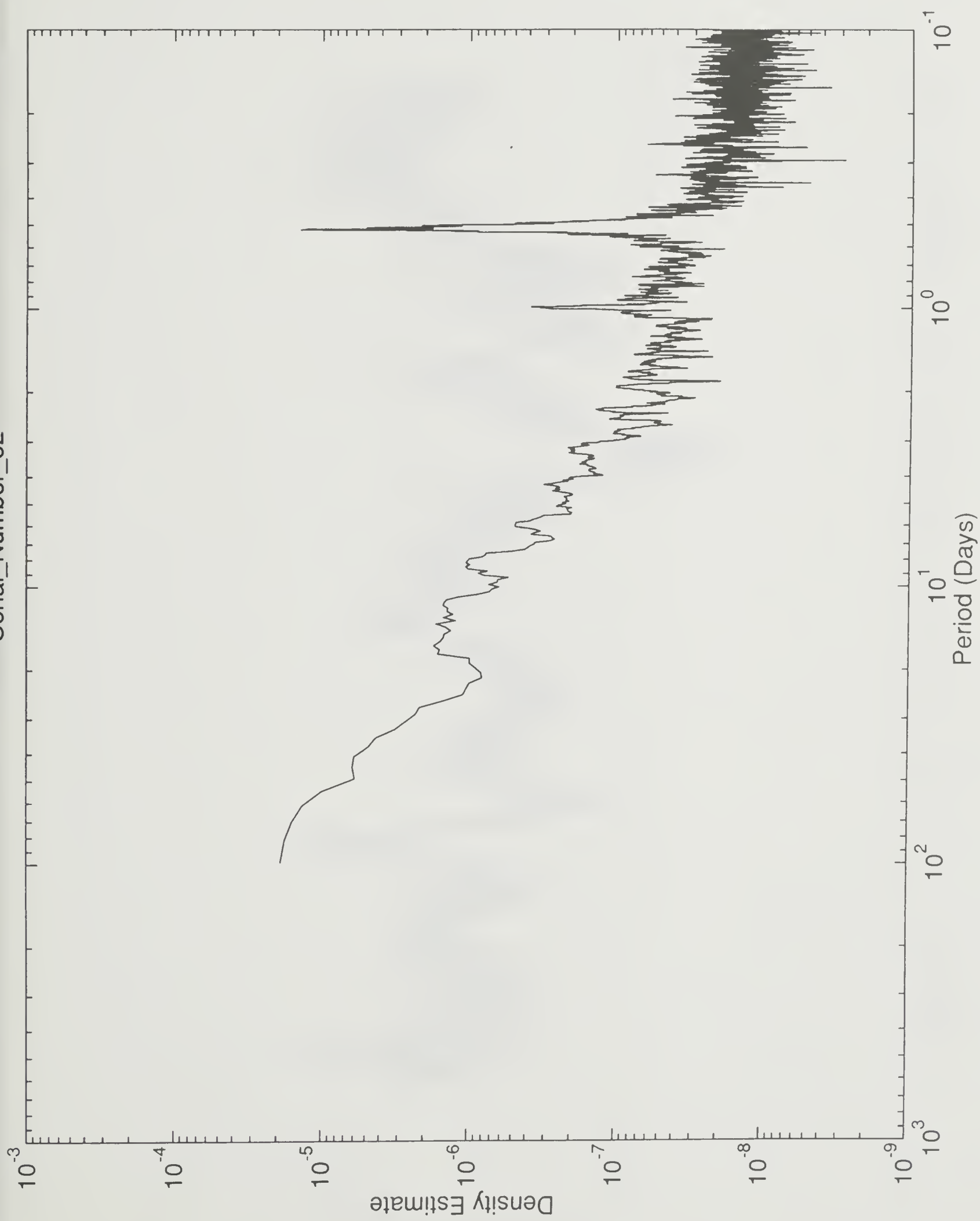




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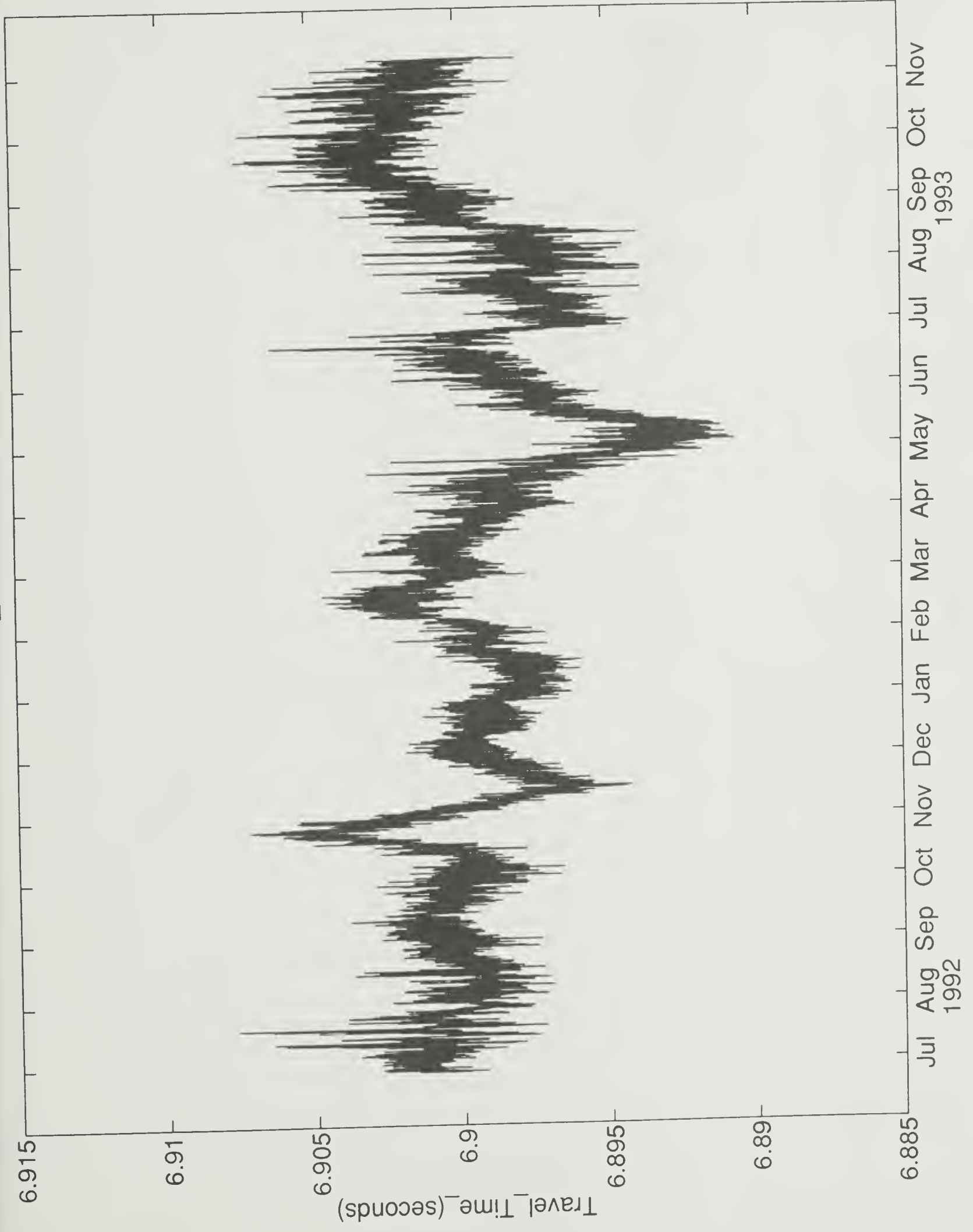




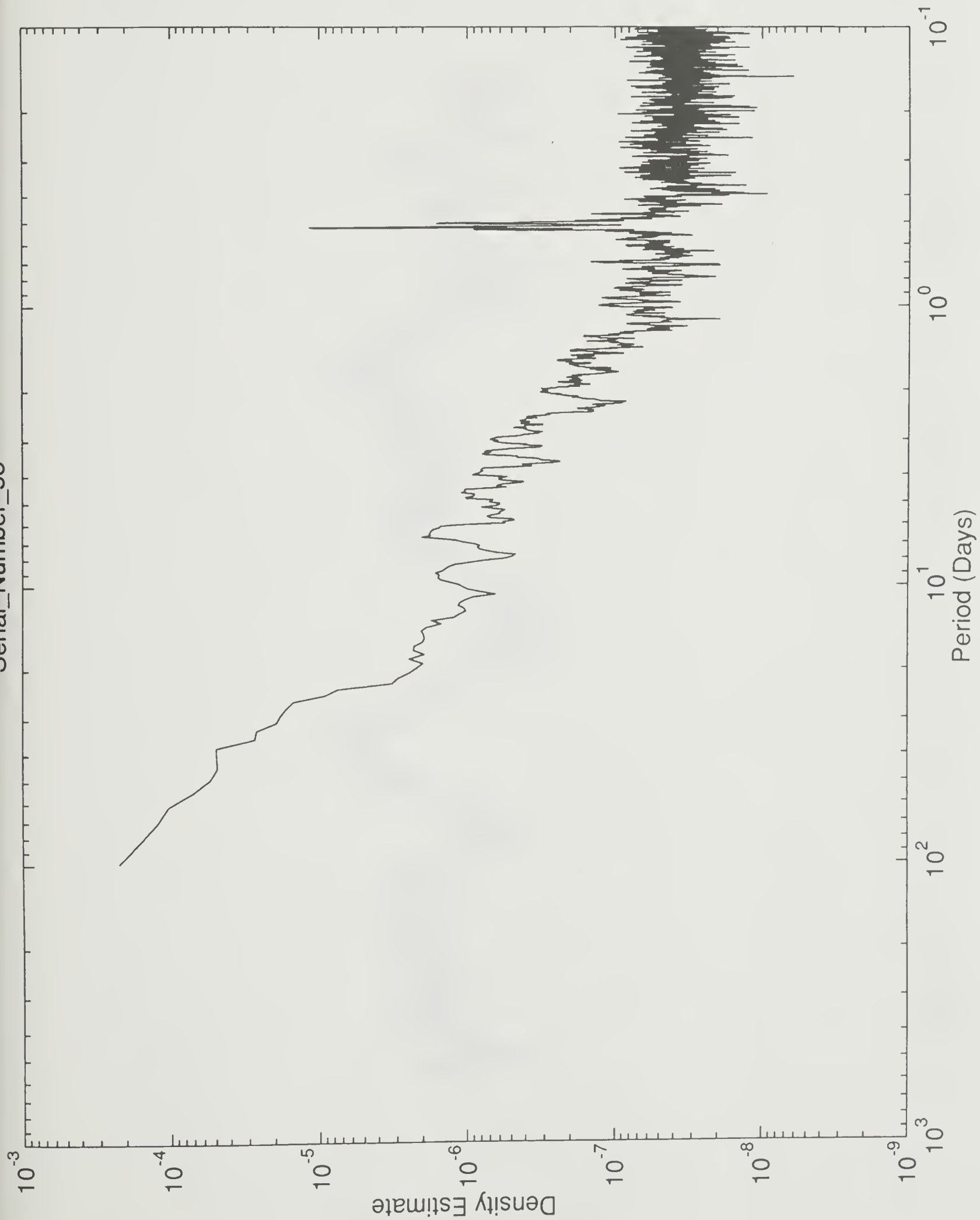




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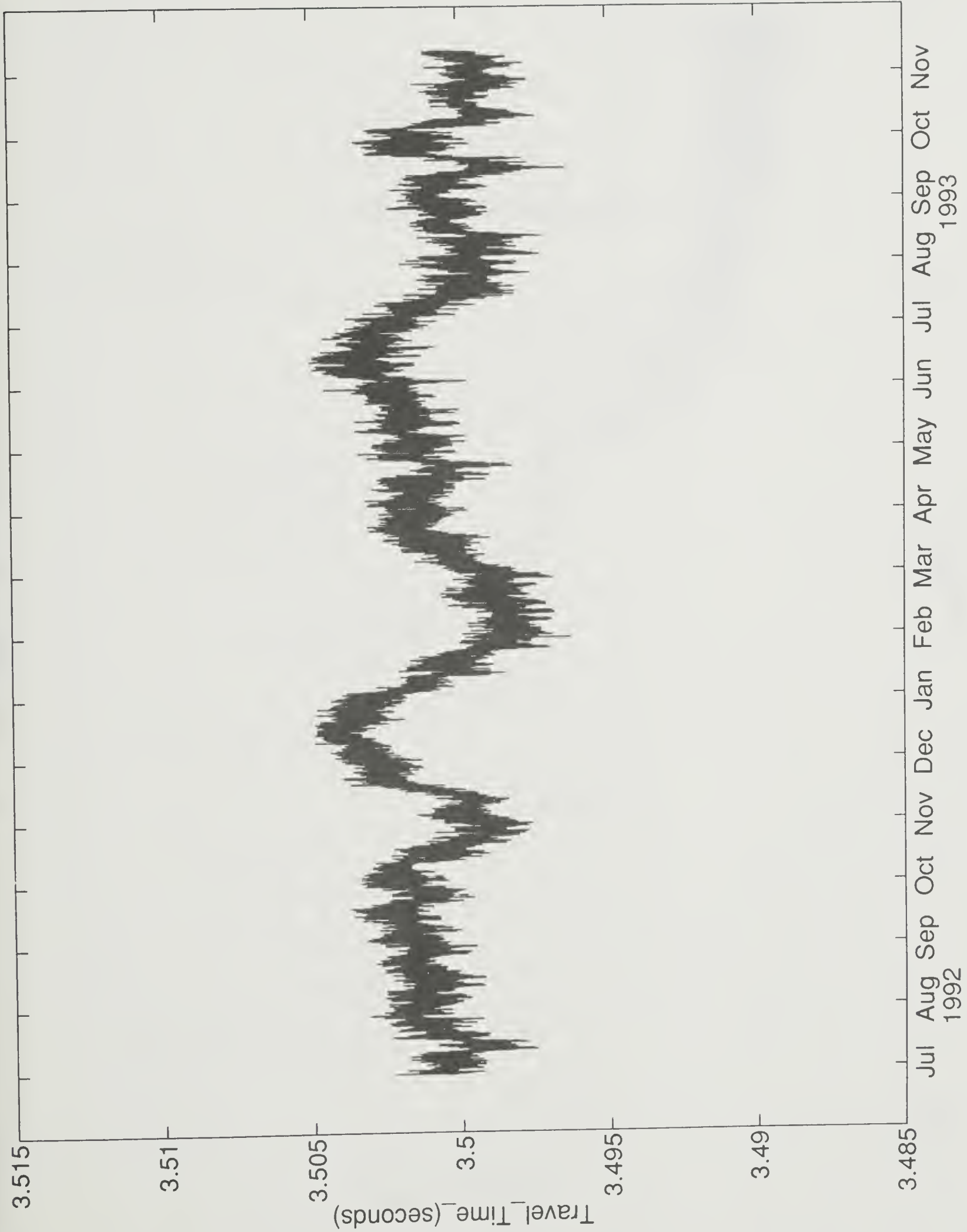






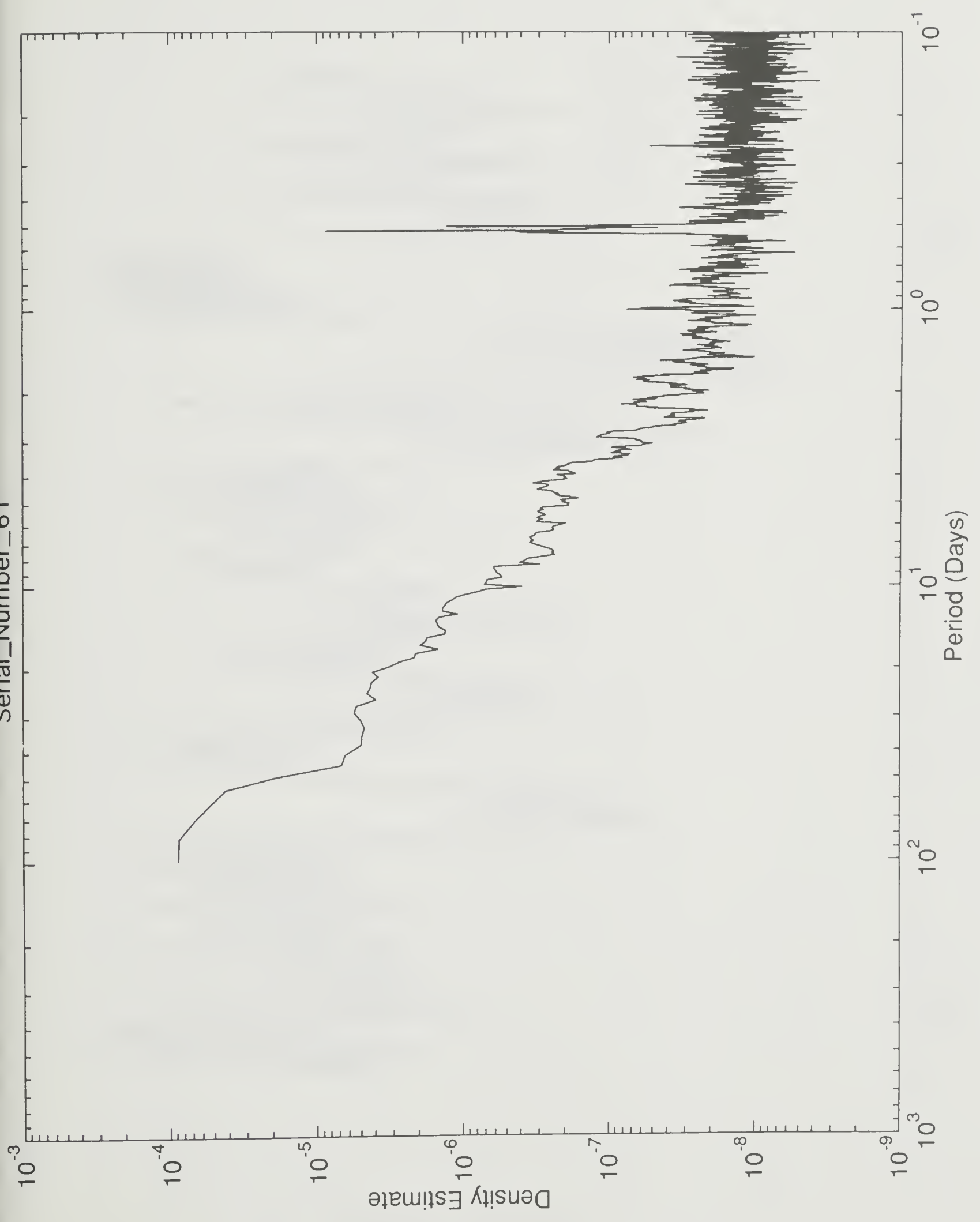


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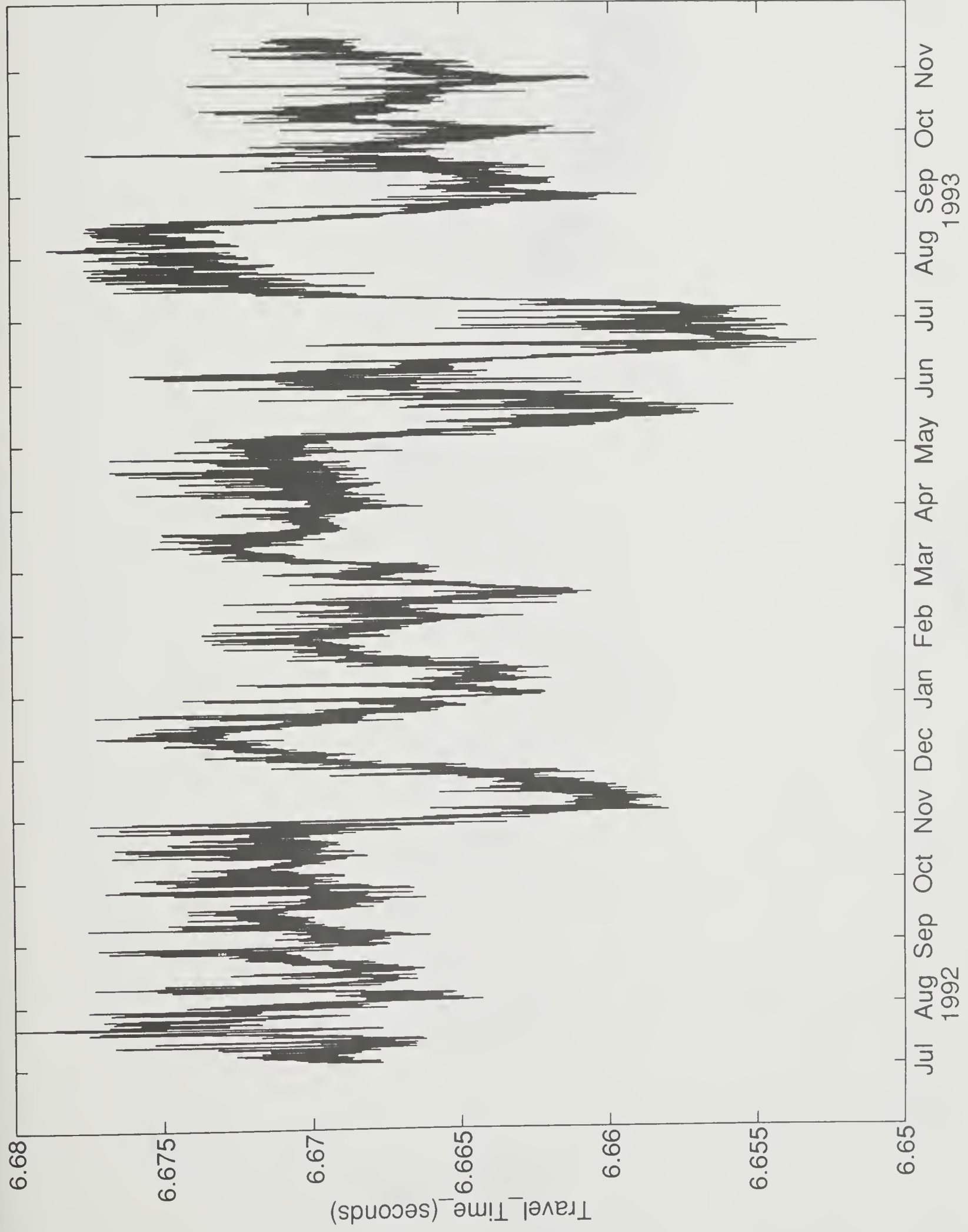


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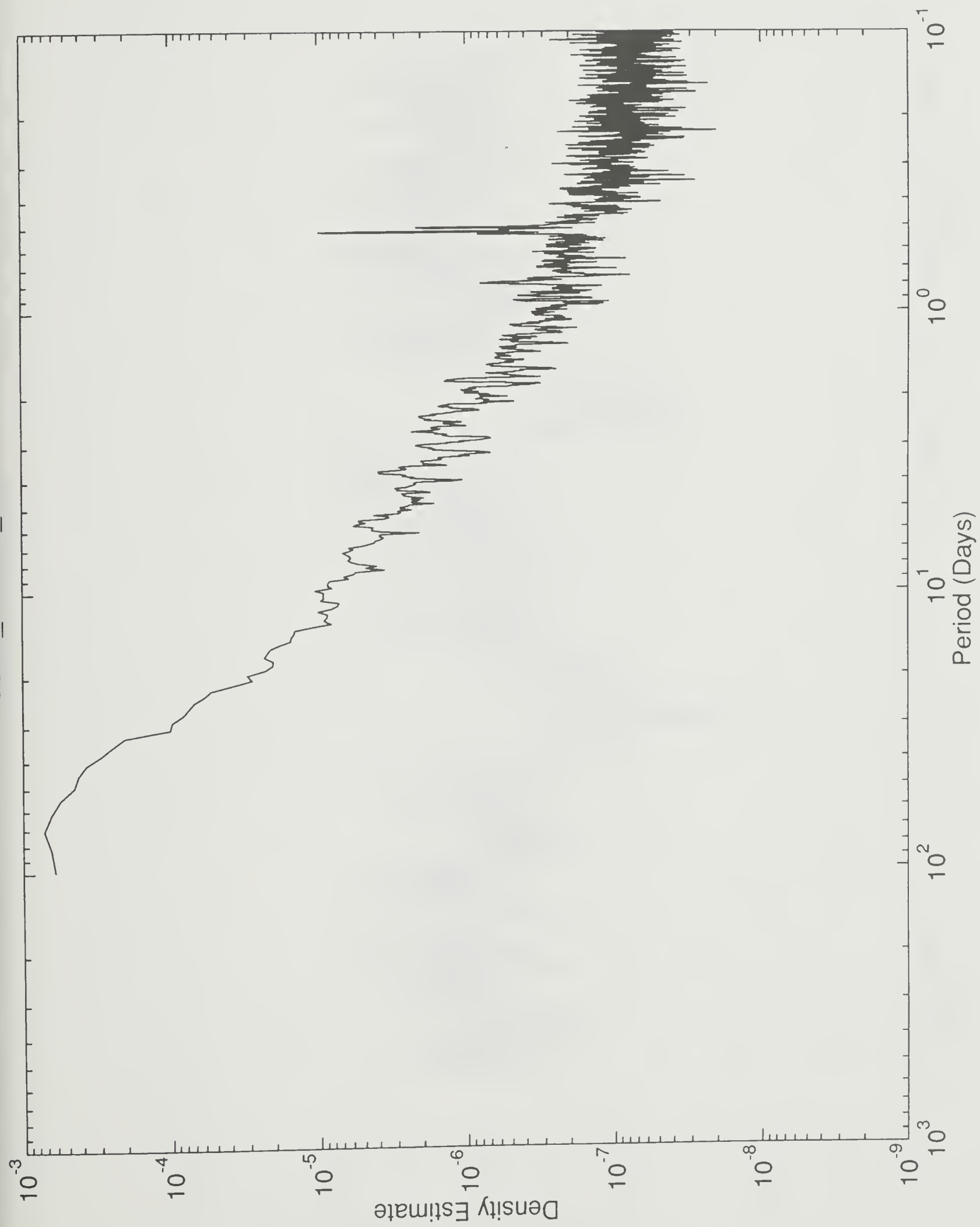


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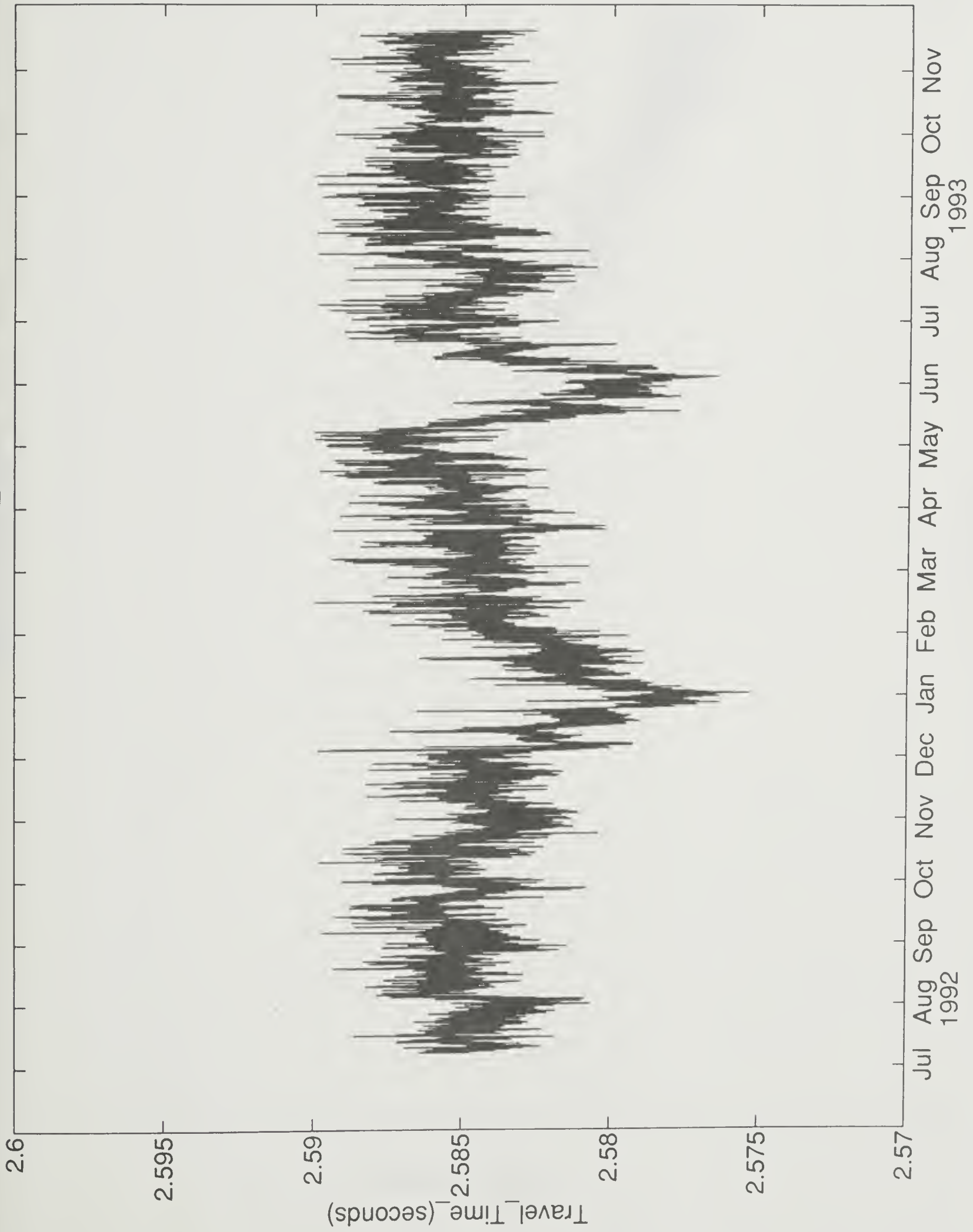






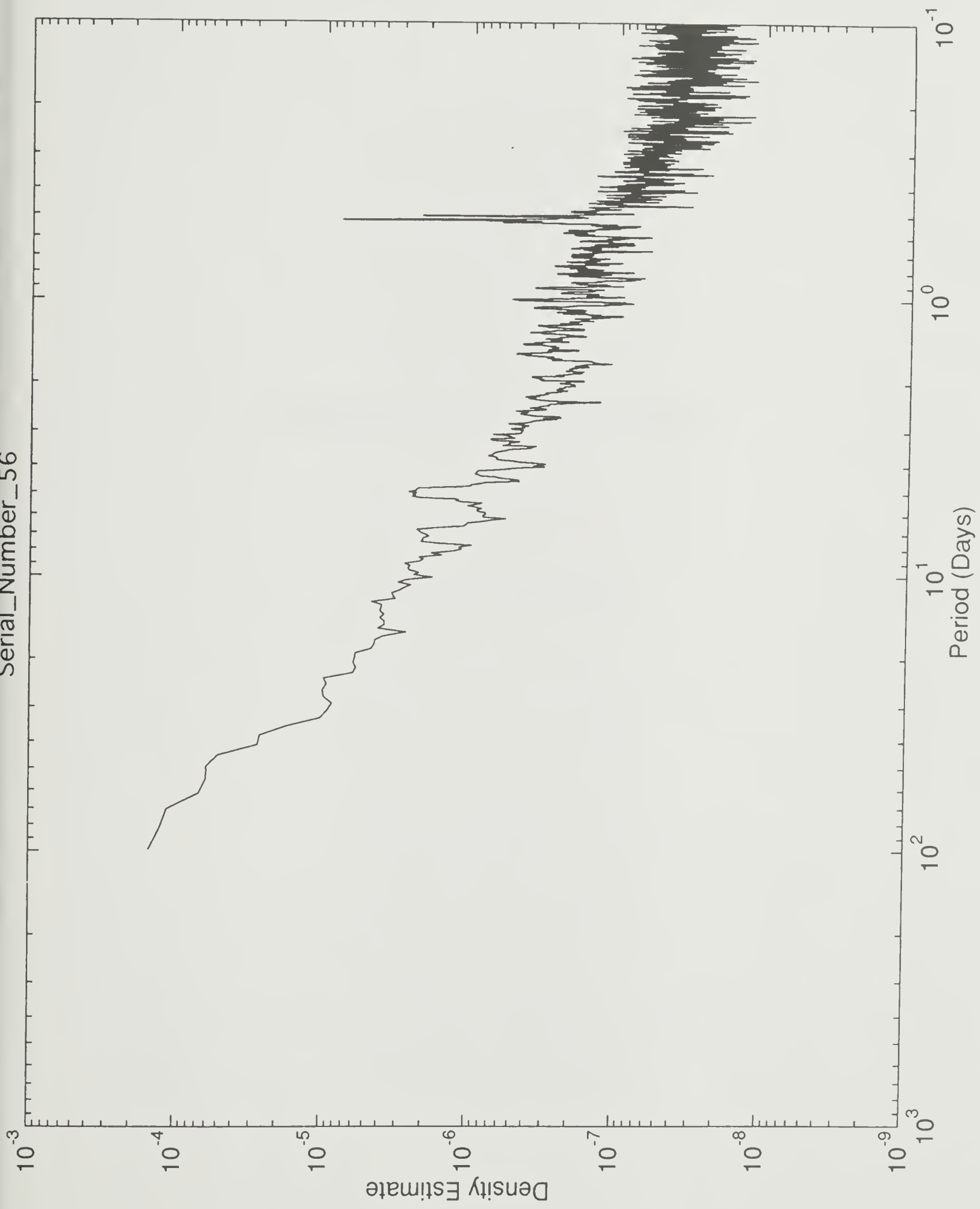


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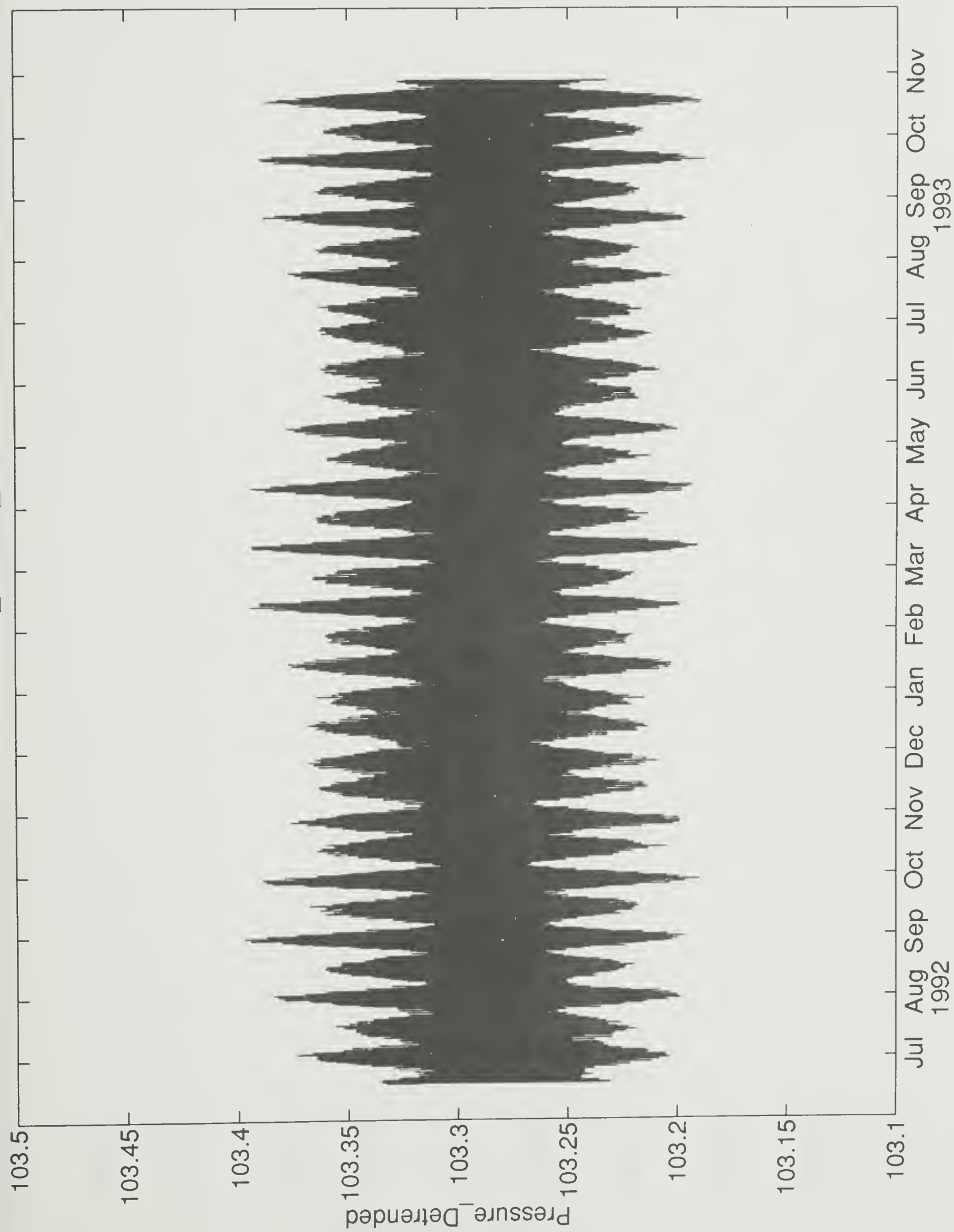




**Bottom Pressure Series  
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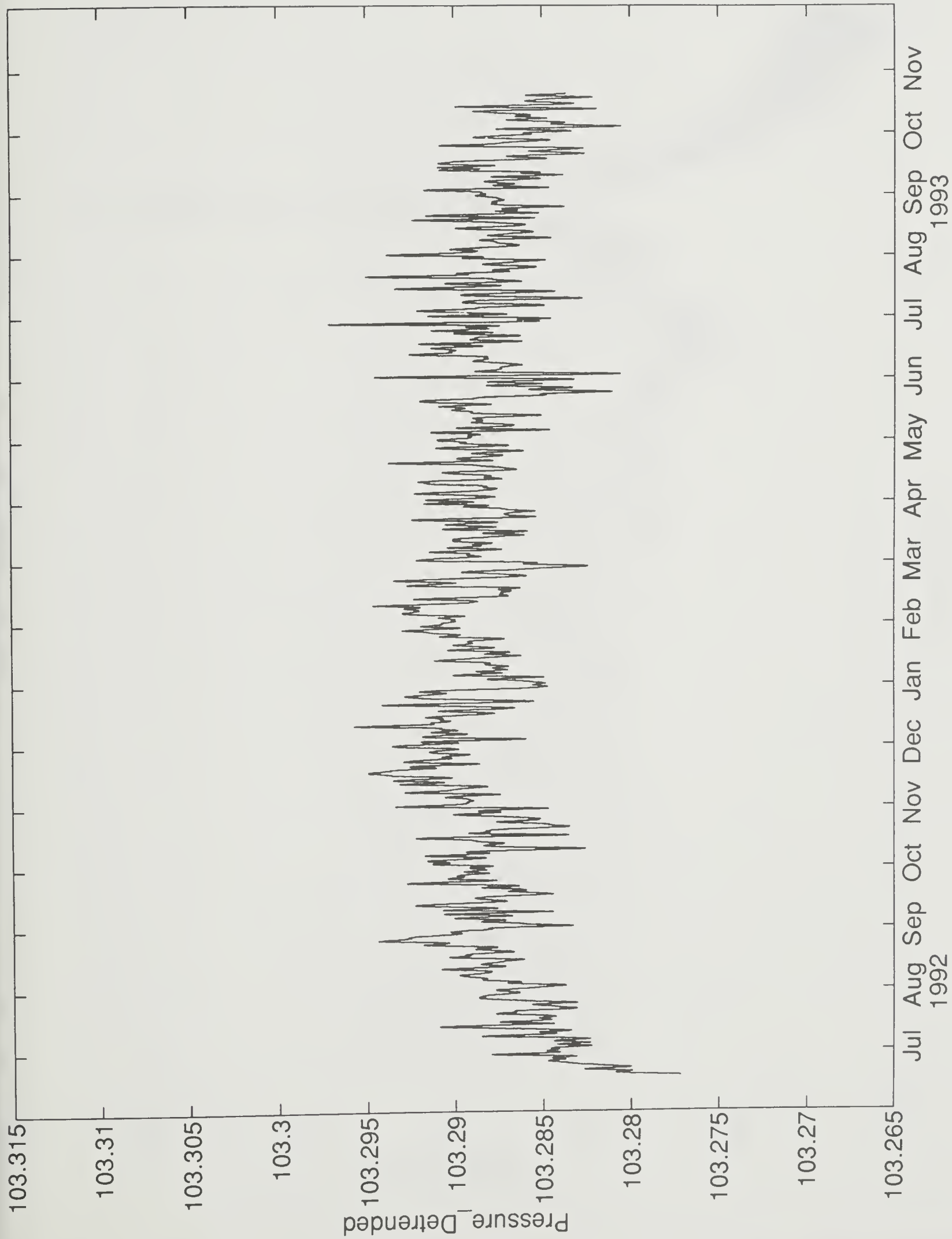


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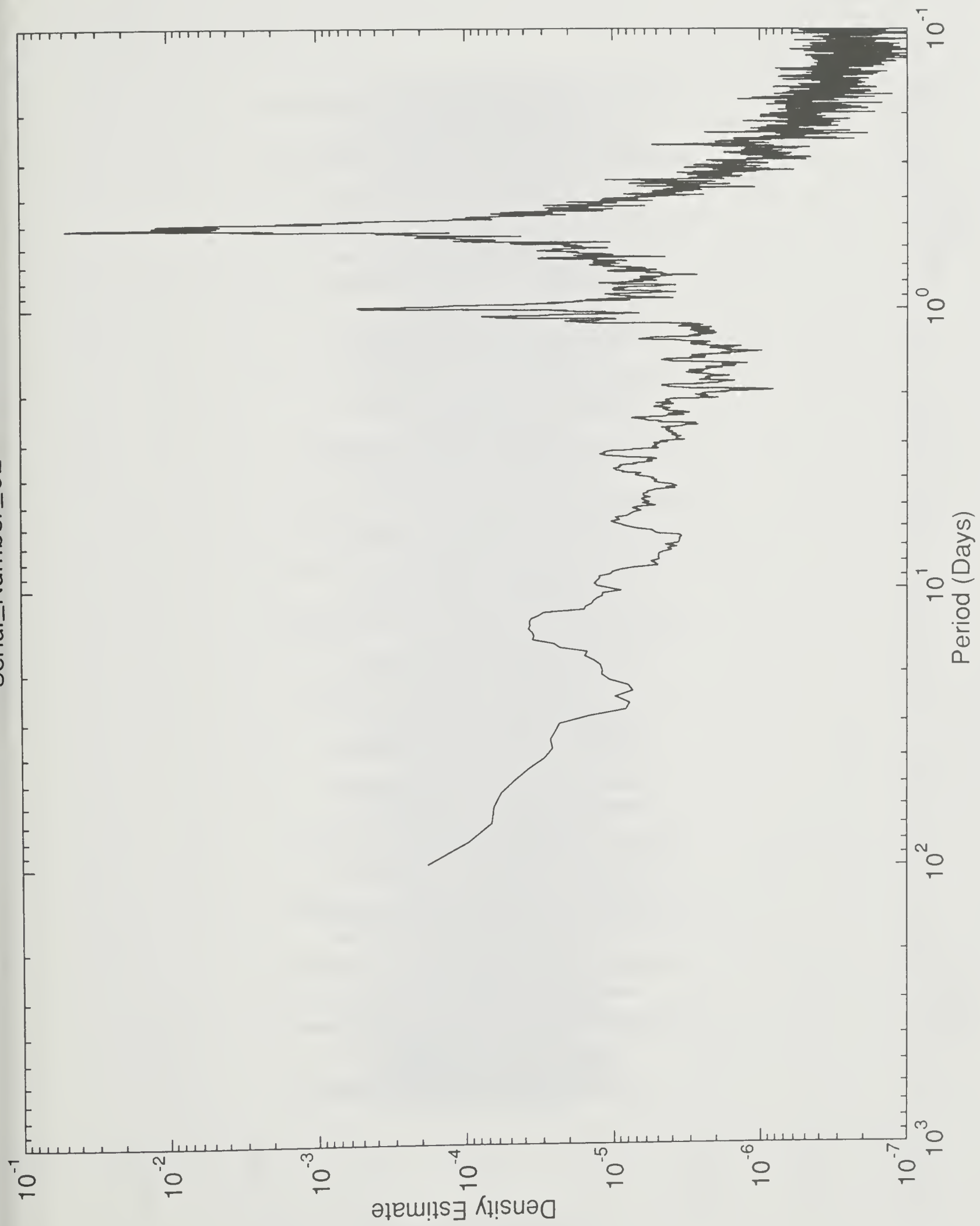


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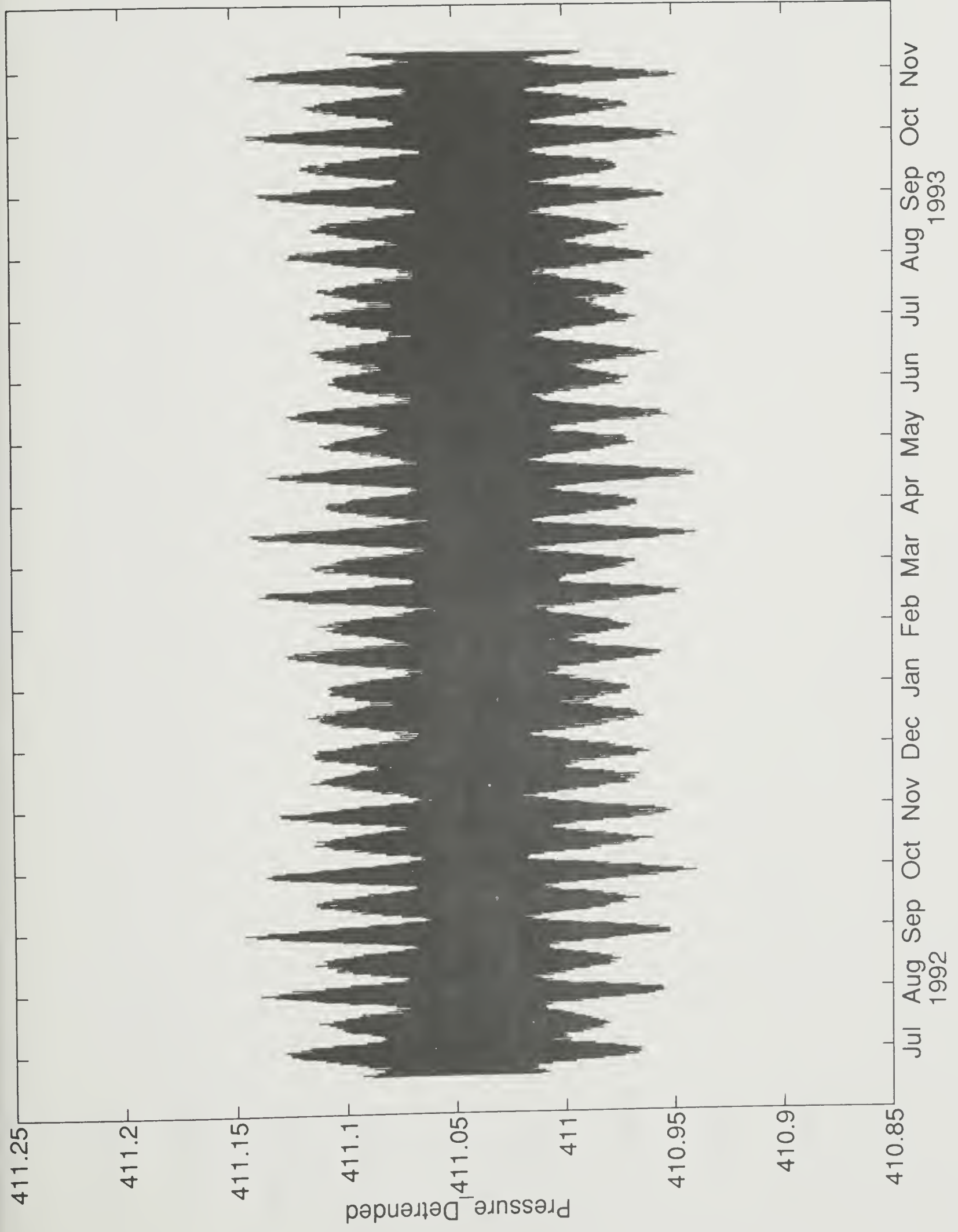






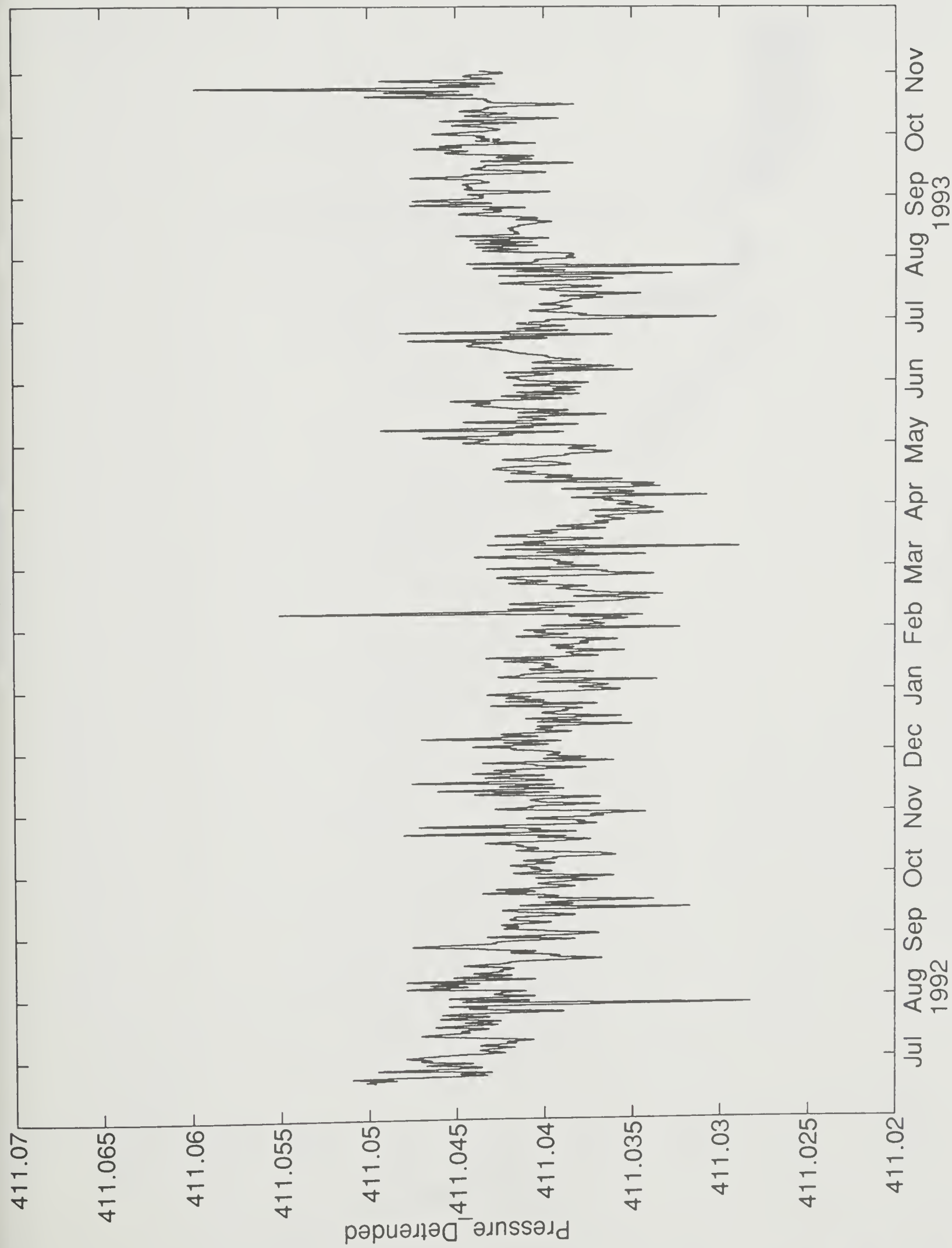


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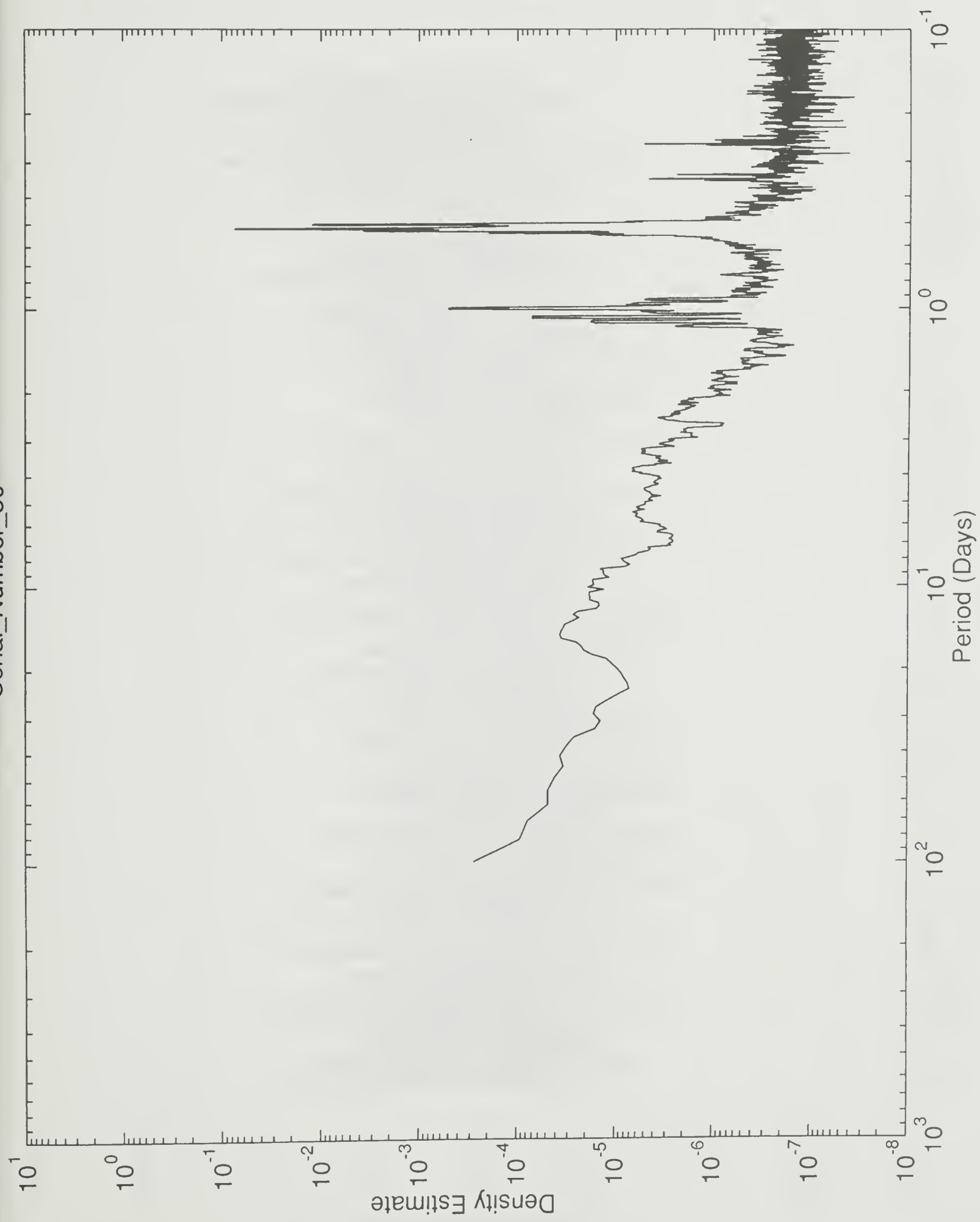
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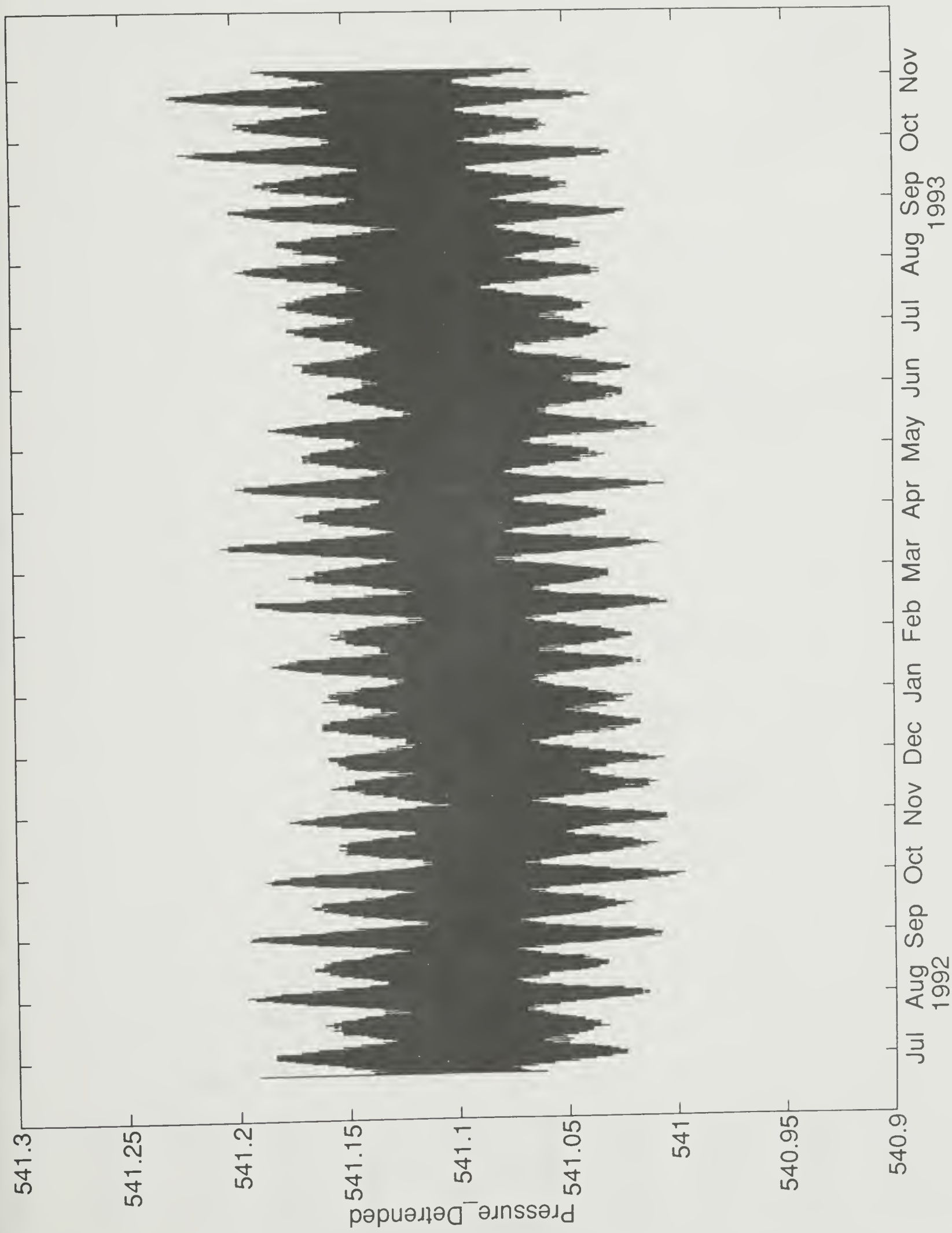


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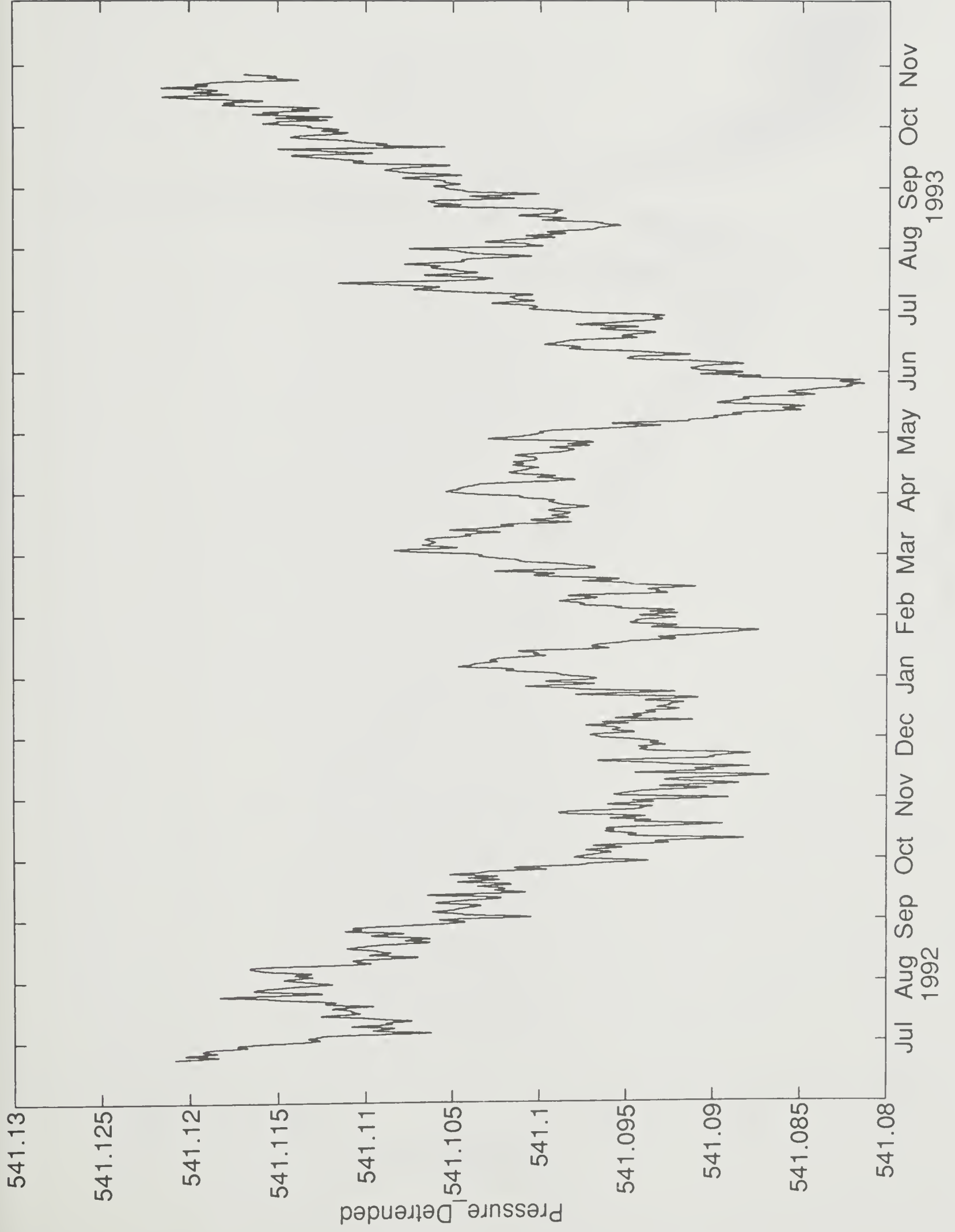


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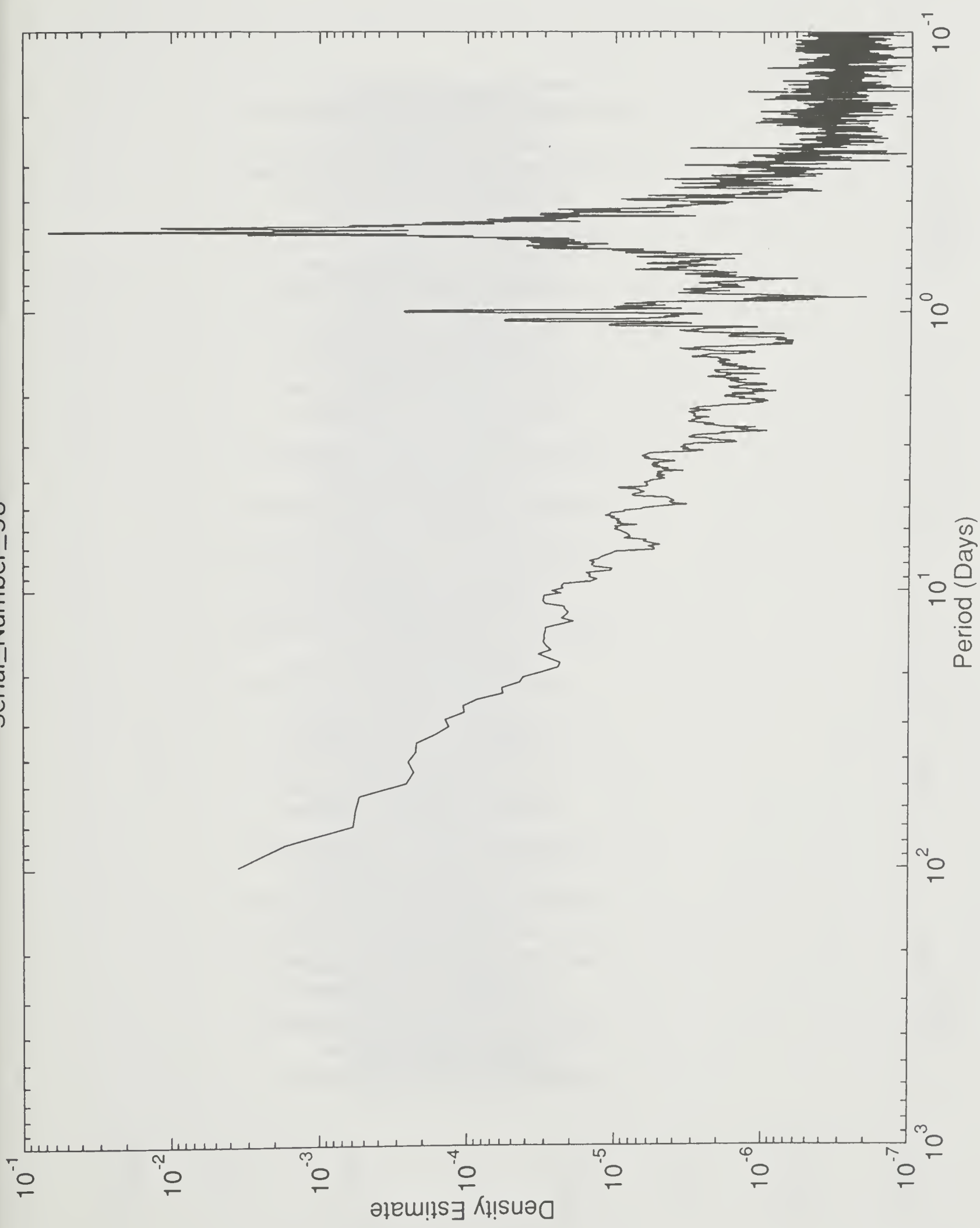


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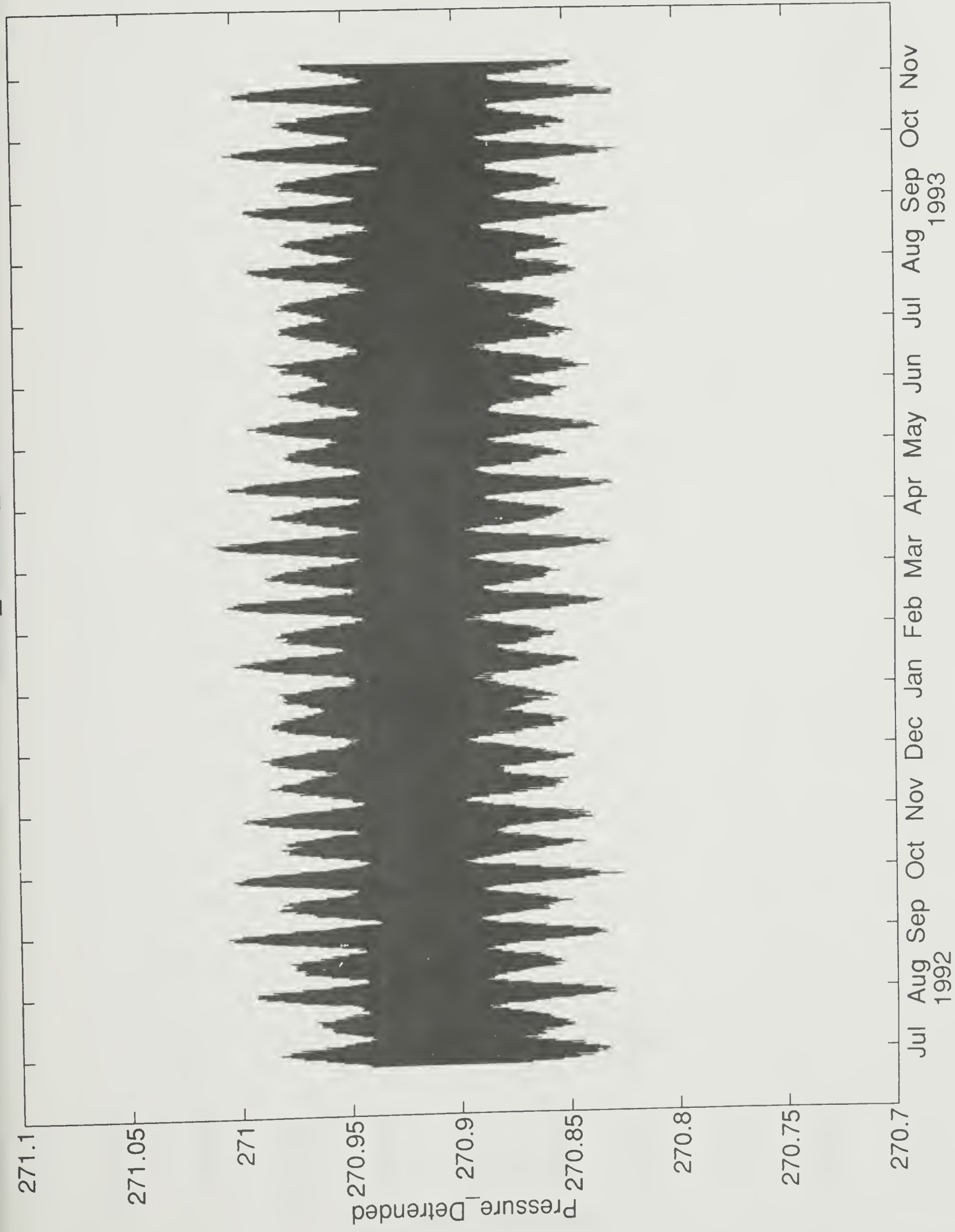




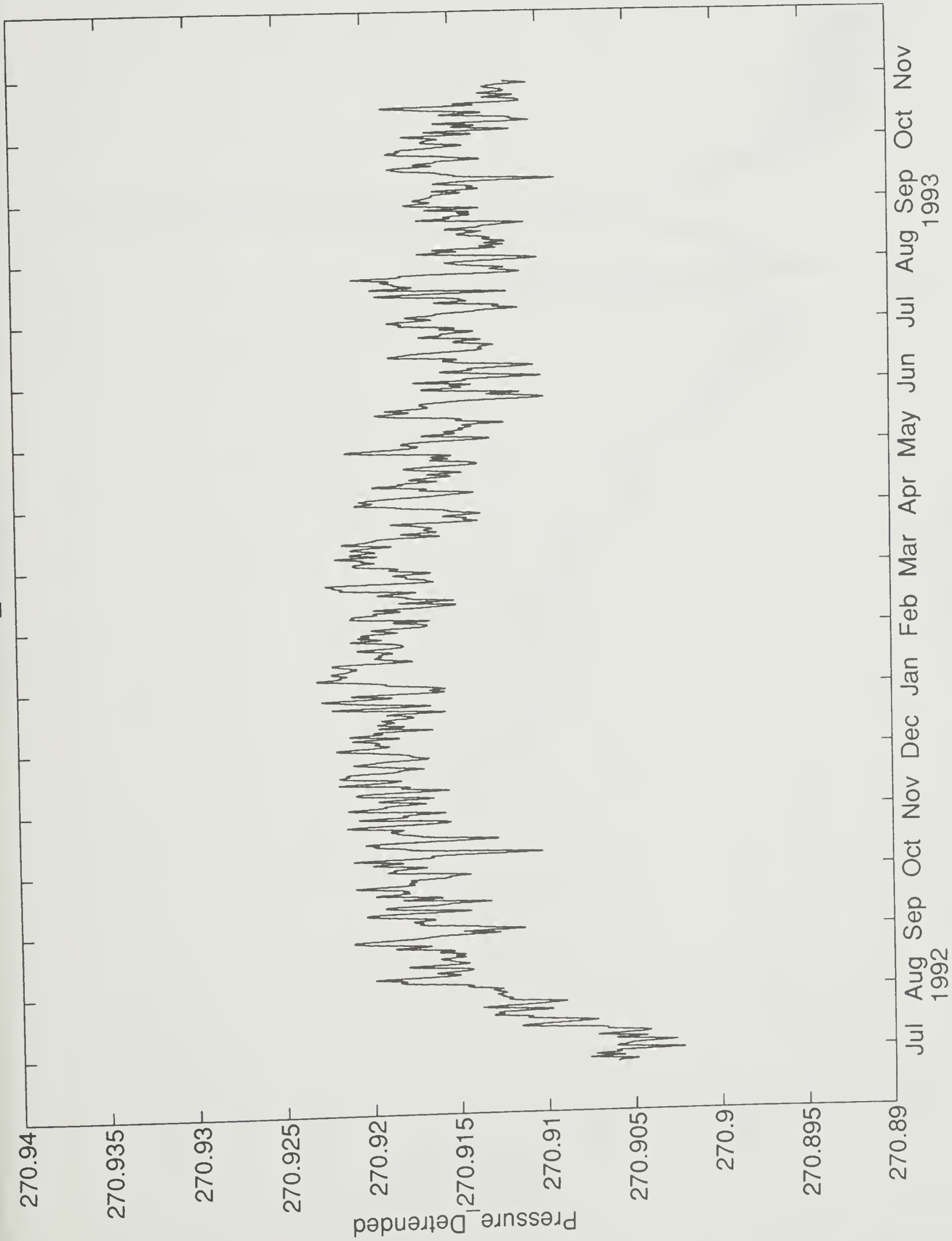




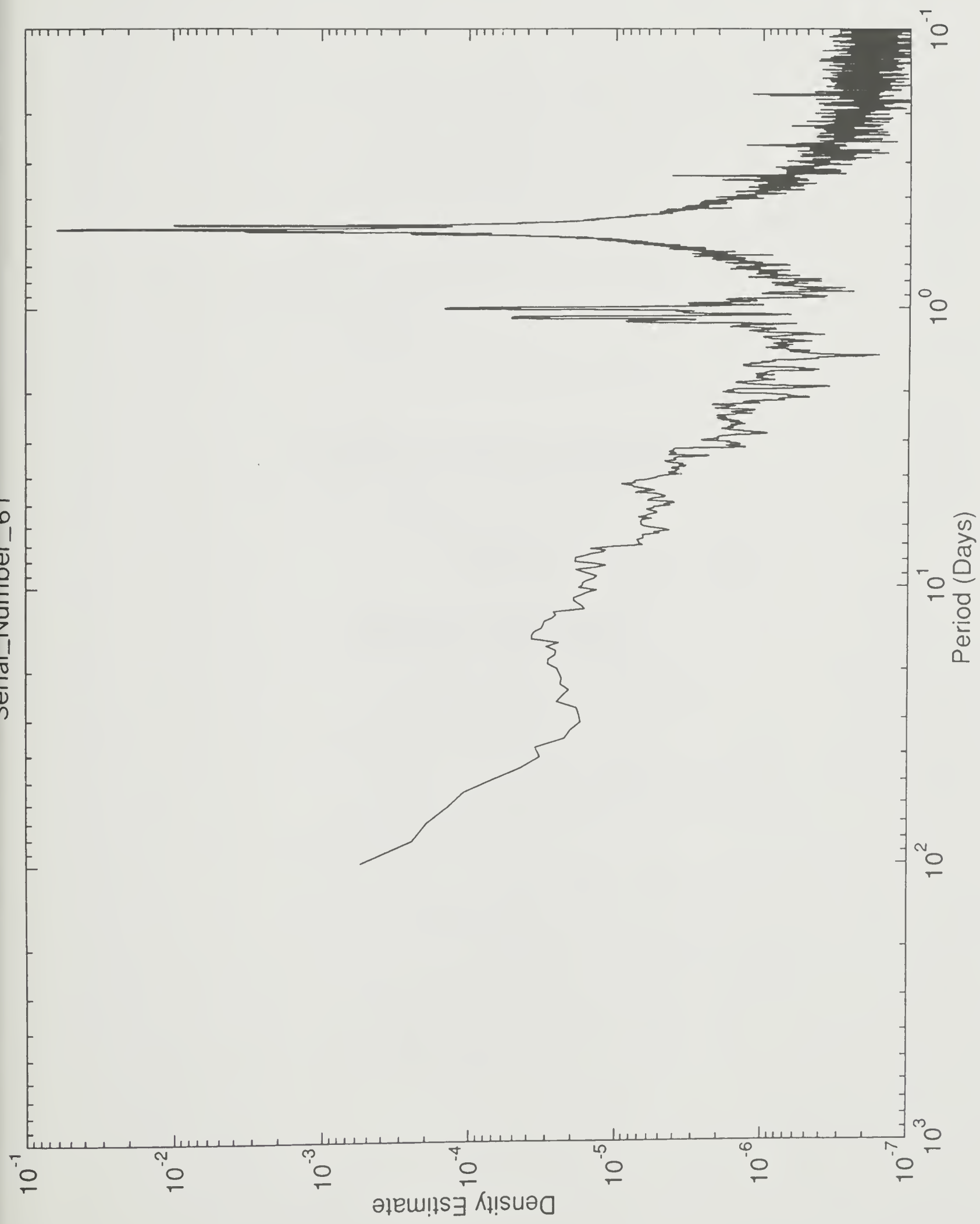
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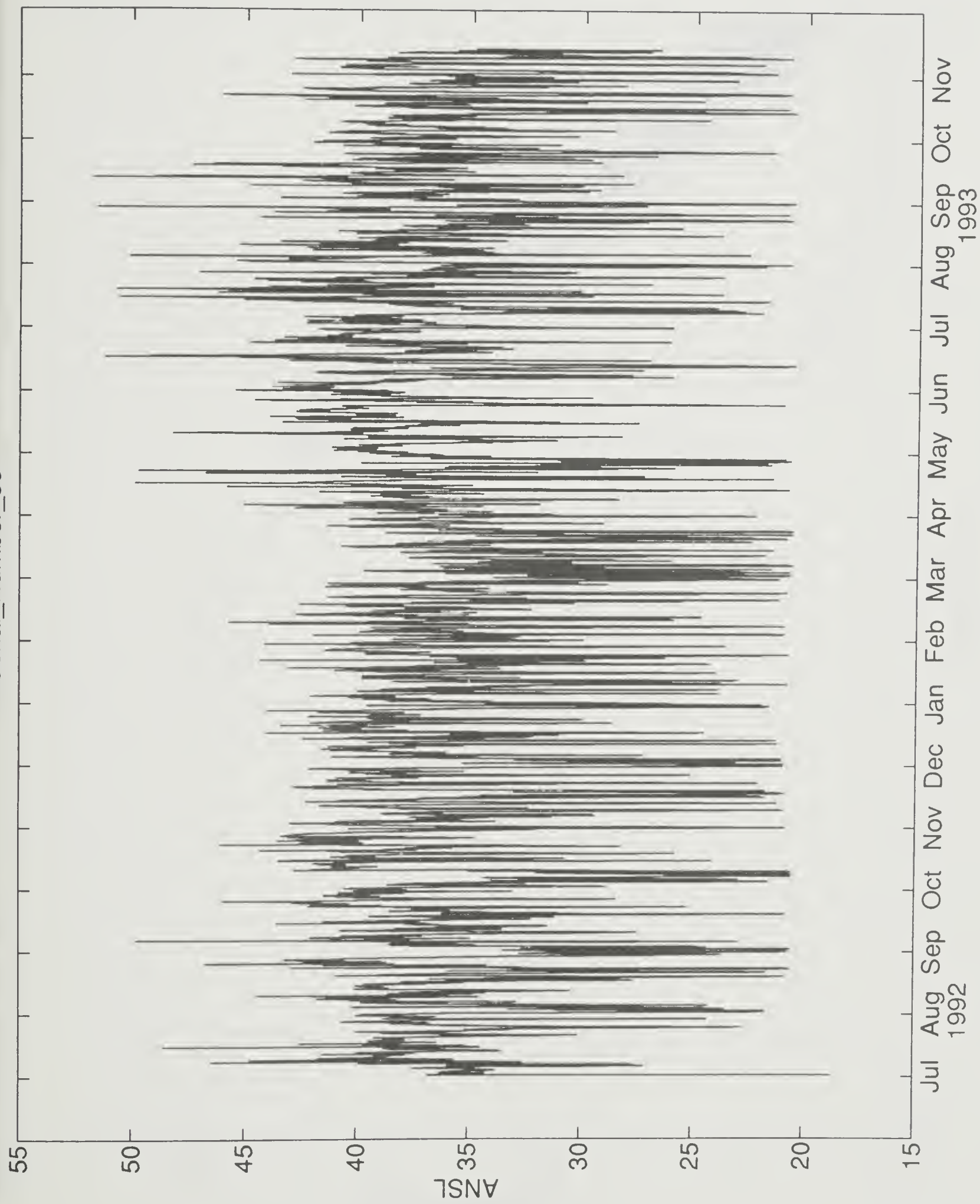




**Ambient Noise Series**  
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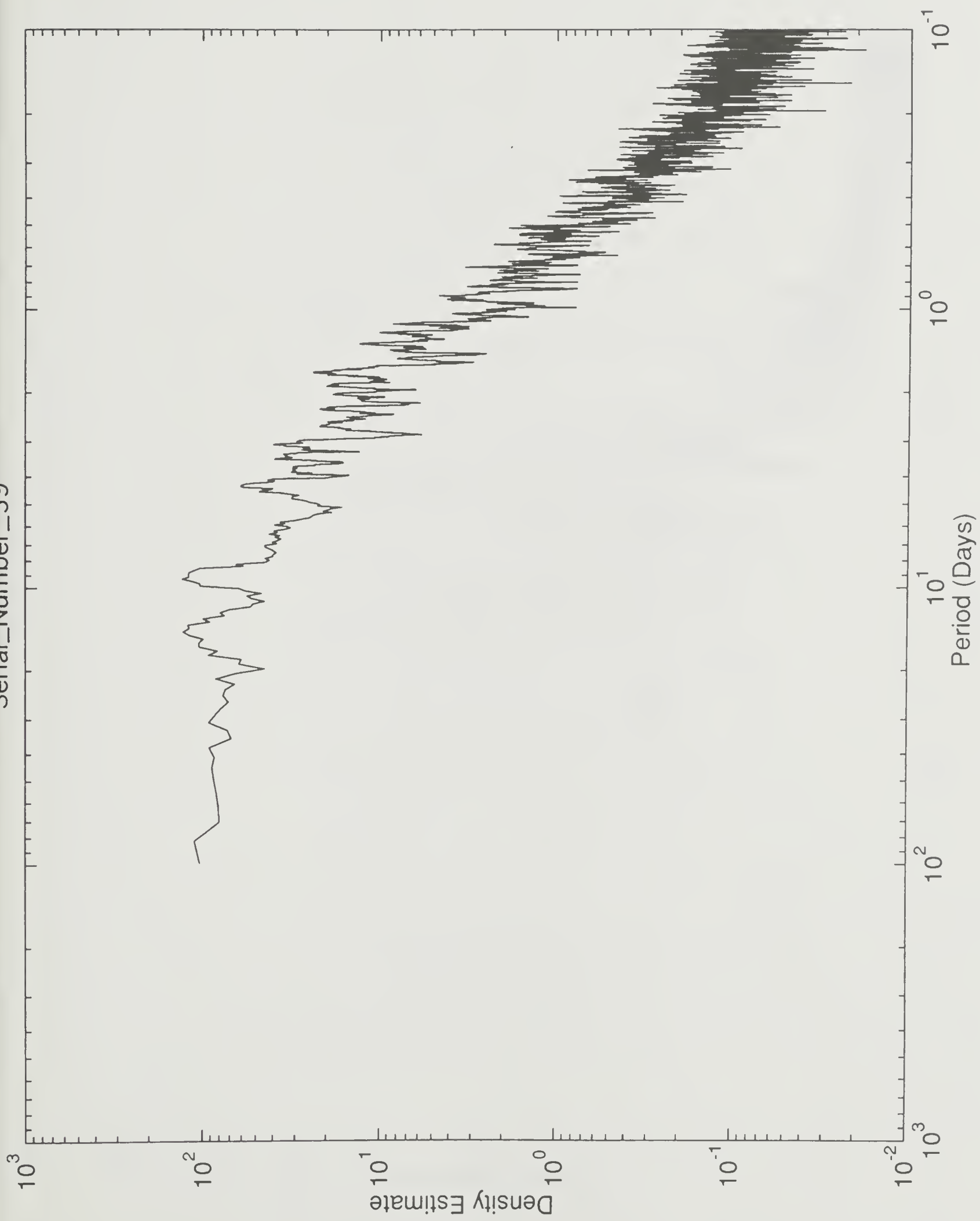


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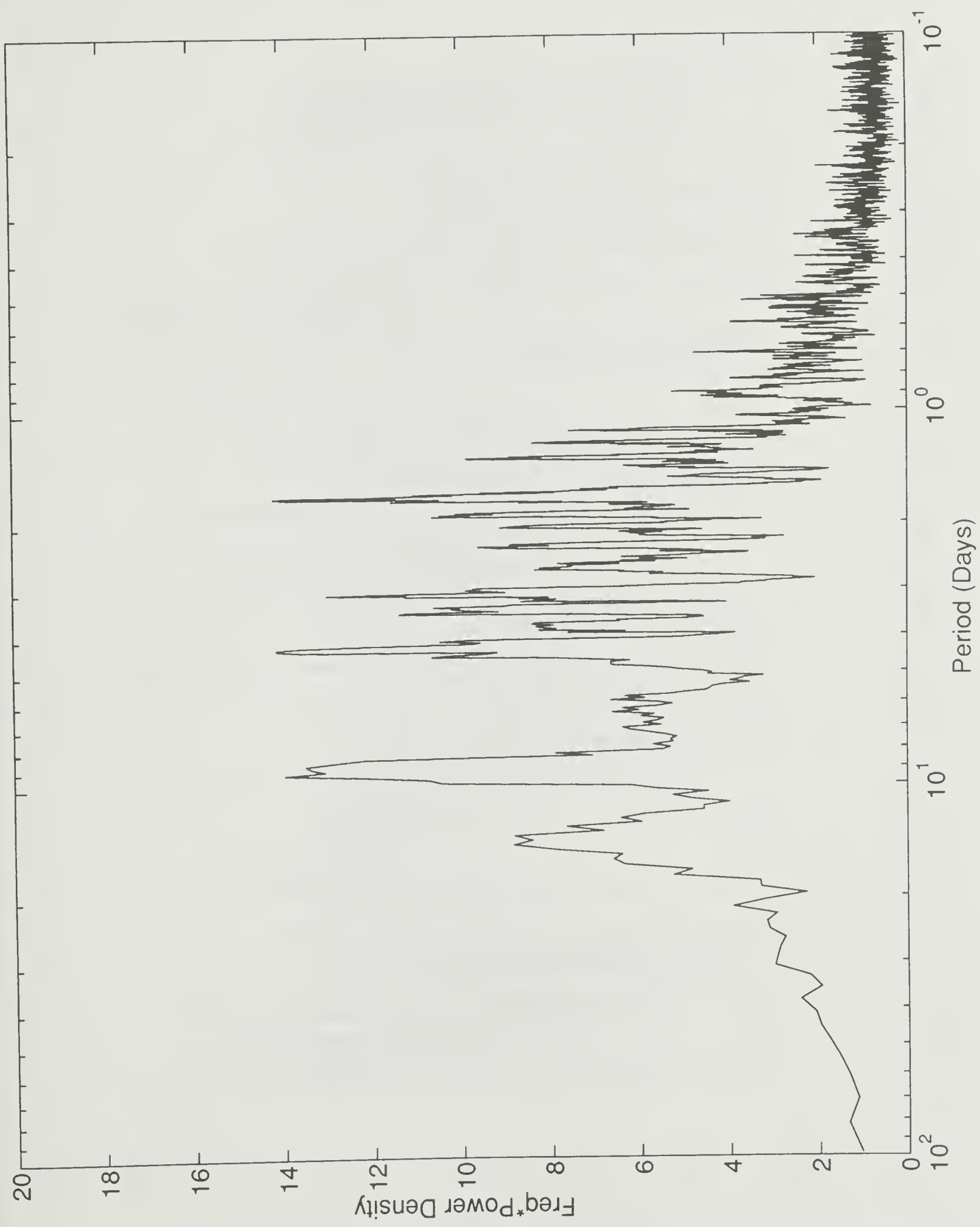


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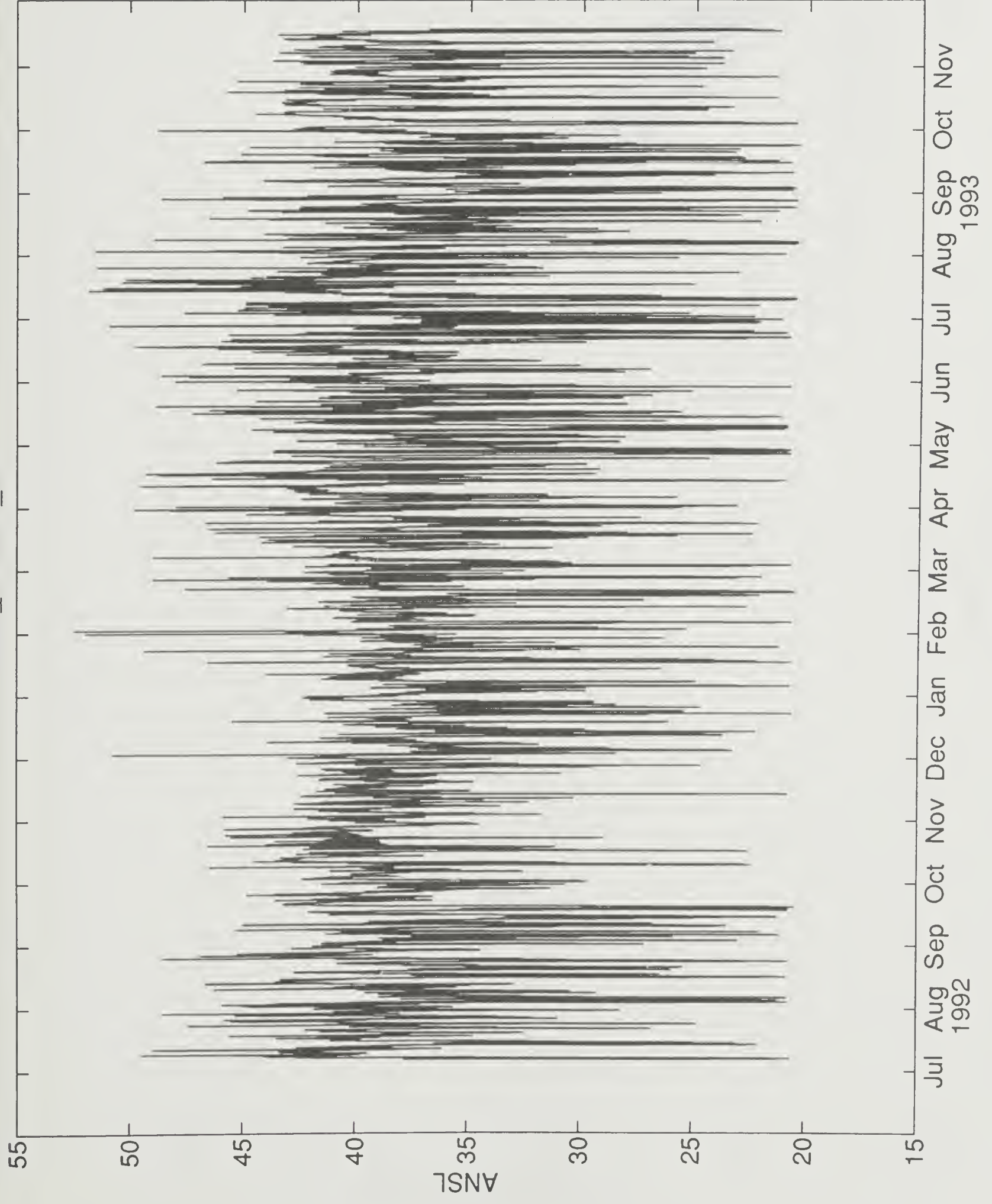




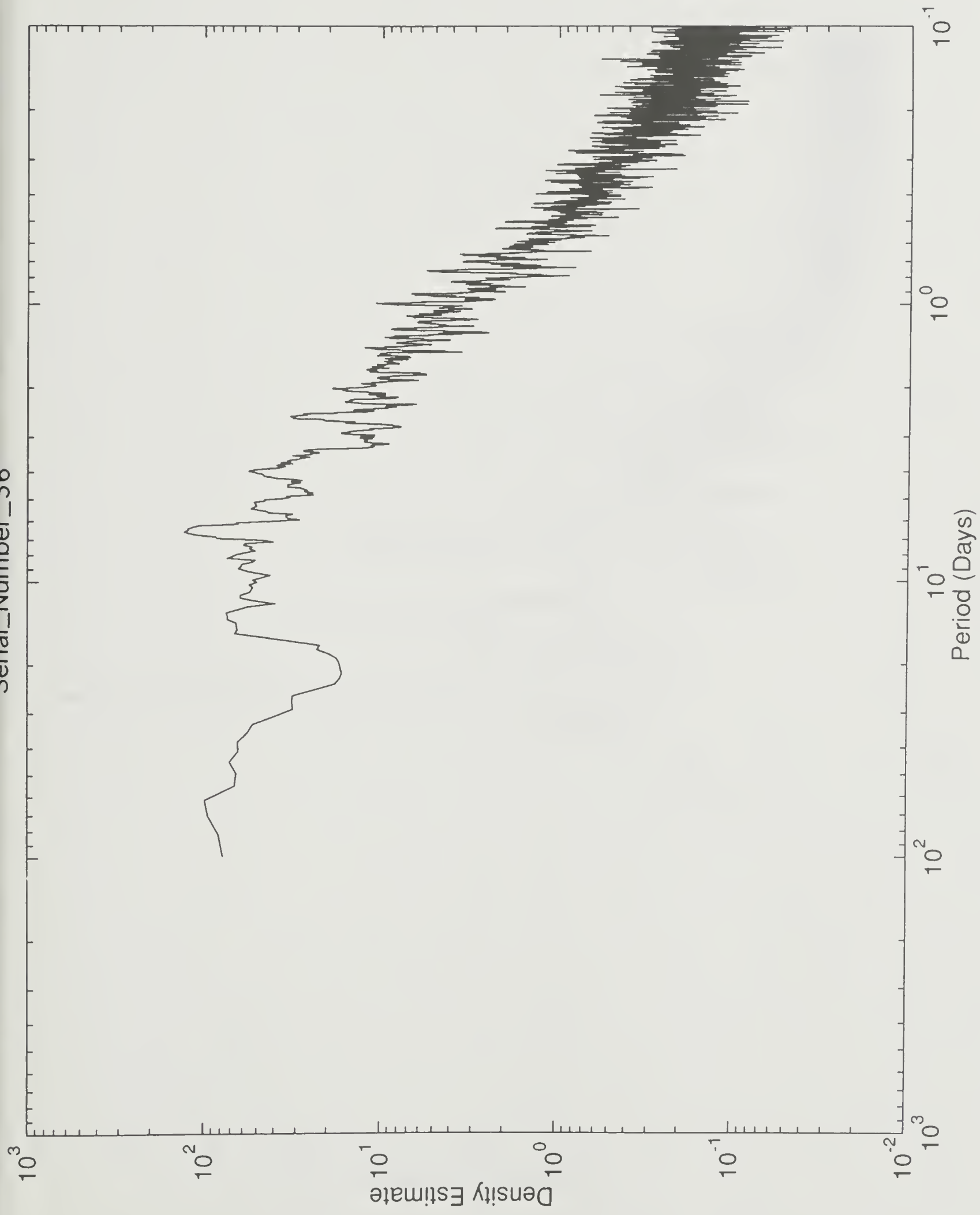




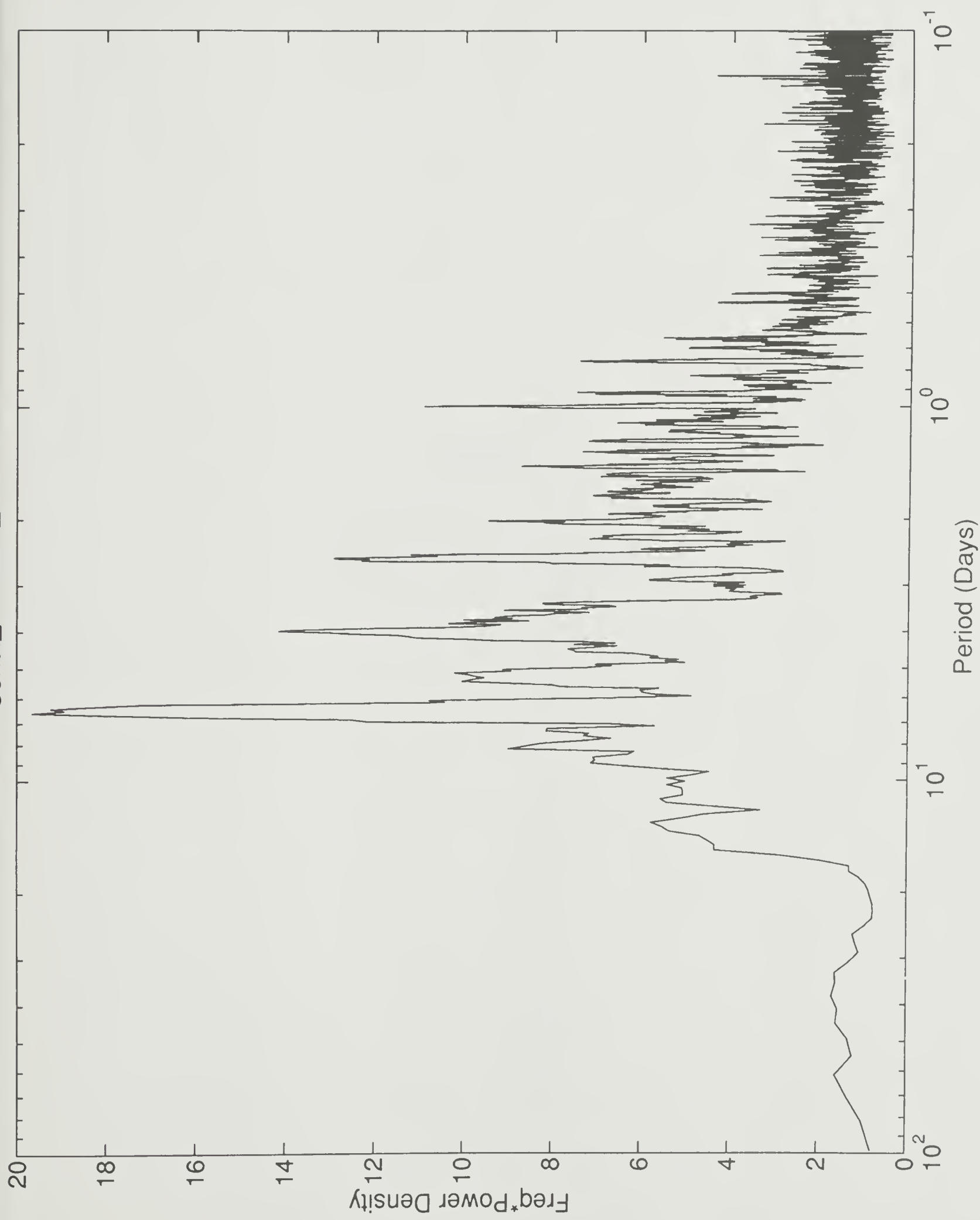
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**XBT**

**BEST III Cruise**



# TABLE II BEST III

BEST III - RV Maurice Ewing - October 24-November 9, 1993

XBT #	LAT (Deg, min)	LONG (Deg, min)	DATE	GMT	Tsurf (3m)
1	30°21.00'S	14°49.00'E	10/26/93	22:21	n/a
2	30°23.79'S	13°54.82'E	10/27/93	13:27	17.4
3	30°18.43'S	13°21.46'E	10/27/93	15:41	17.3
4	30°12.28'S	12°52.52'E	10/27/93	23:38	17.3
6	30°01.84'S	12°10.34'E	10/28/93	2:51	17.2
7	29°59.32'S	11°37.35'E	10/28/93	12:50	17.3
8	29°59.68'S	11°14.28'E	10/28/93	14:38	17.9
9	29°59.23'S	10°49.93'E	10/28/93	18:34	17.8
10	30°00.06'S	10°25.27'E	10/28/93	20:32	17.9
11	30°00.40'S	10°05.80'E	10/28/93	22:04	17.9
12	30°00.29'S	09°38.48'E	10/29/93	10:51	17.6
13	29°59.58'S	09°15.20'E	10/29/93	12:34	17.7
14	29°58.51'S	08°49.71'E	10/29/93	14:29	17.7
15	30°00.12'S	08°28.21'E	10/29/93	23:12	17.7
16	29°59.88'S	08°05.61'E	10/30/93	0:59	17.7
17	30°00.11'S	07°39.37'E	10/30/93	3:02	18.3
18	30°00.24'S	07°06.80'E	10/30/93	11:49	18.6
19	30°00.14'S	06°43.76'E	10/30/93	13:32	18.4
20	30°00.53'S	06°22.71'E	10/30/93	15:06	18.8
21	29°58.44'S	05°39.30'E	10/31/93	0:51	19.0
23	29°54.76'S	04°51.13'E	10/31/93	4:36	18.8
24	29°58.50'S	04°25.33'E	10/31/93	15:04	19.1
25	29°56.24'S	04°08.89'E	10/31/93	16:19	19.4
26	29°53.54'S	03°48.00'E	10/31/93	17:57	19.4
27	29°51.44'S	03°26.38'E	10/31/93	19:39	19.3
28	29°48.79'S	03°03.62'E	10/31/93	21:25	18.9
29	30°03.48'S	03°10.63'E	11/1/93	4:42	18.9



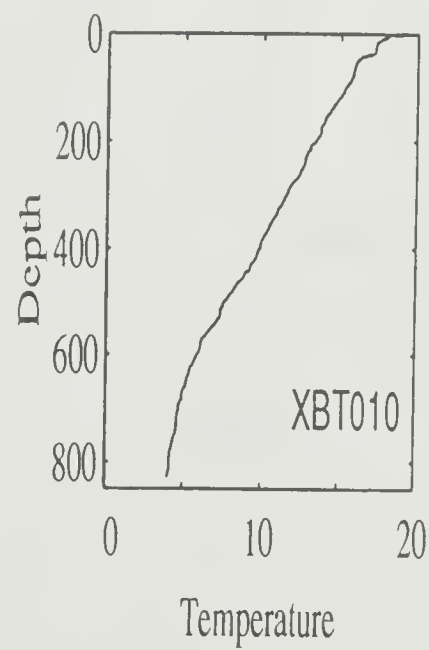
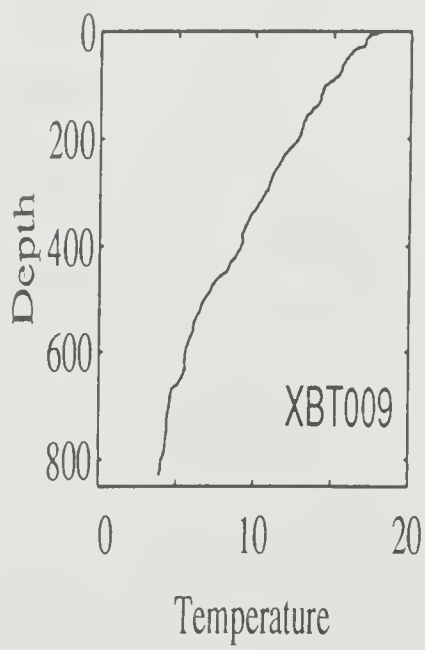
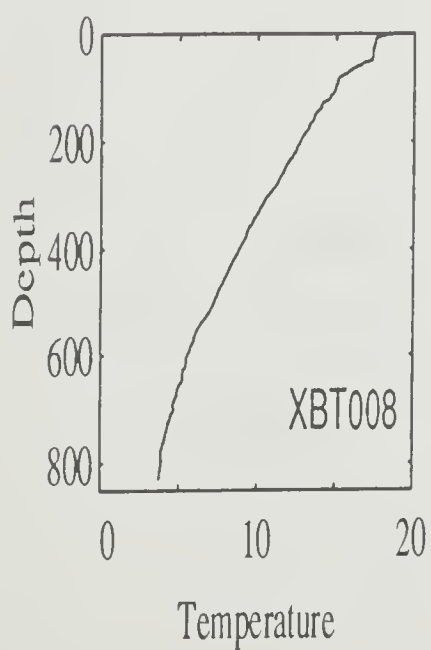
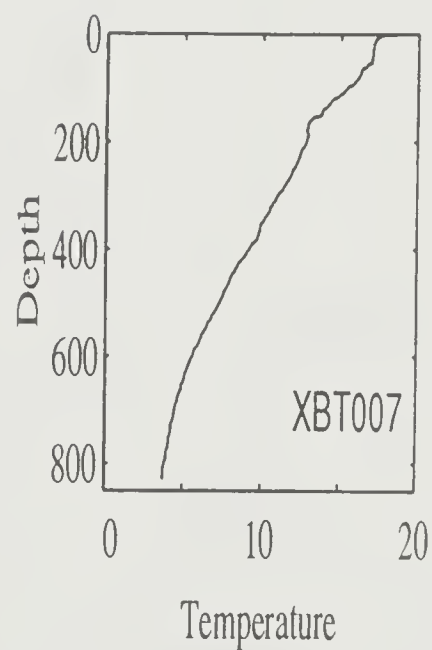
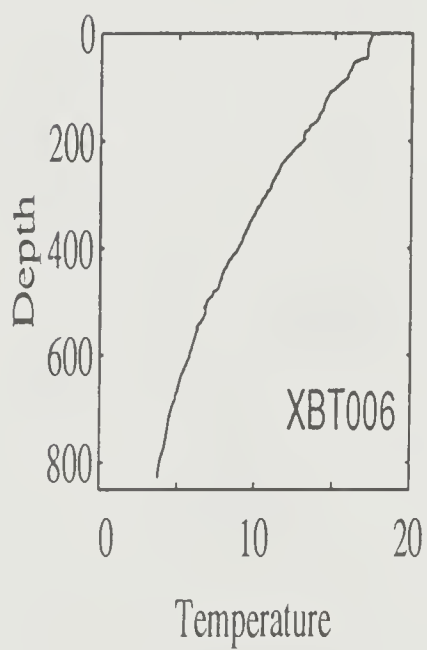
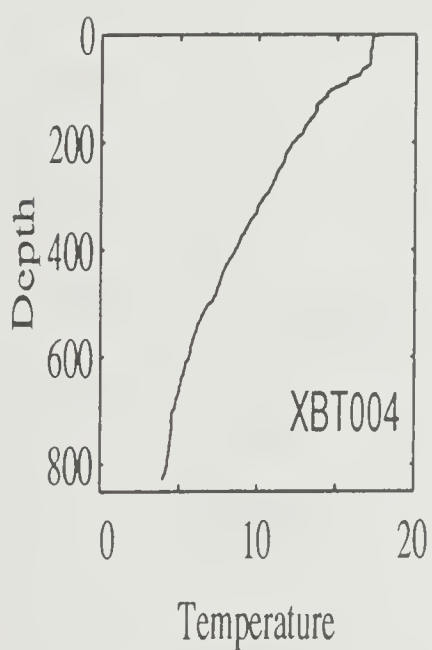
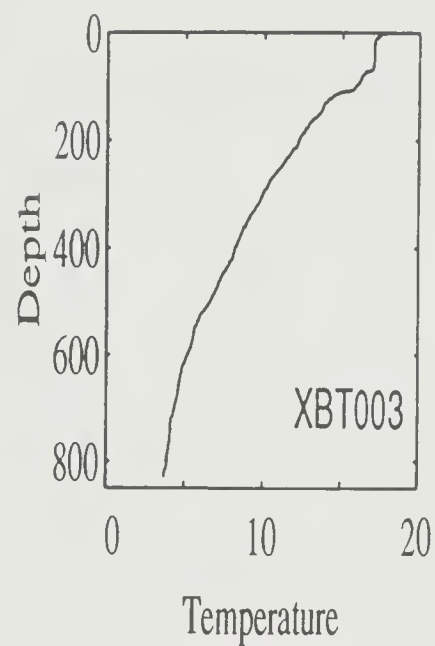
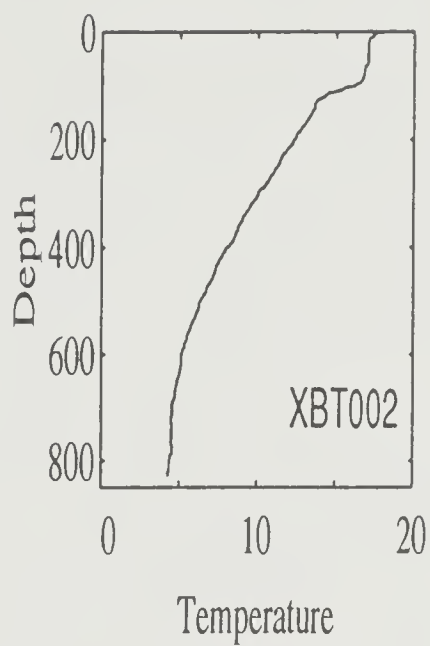
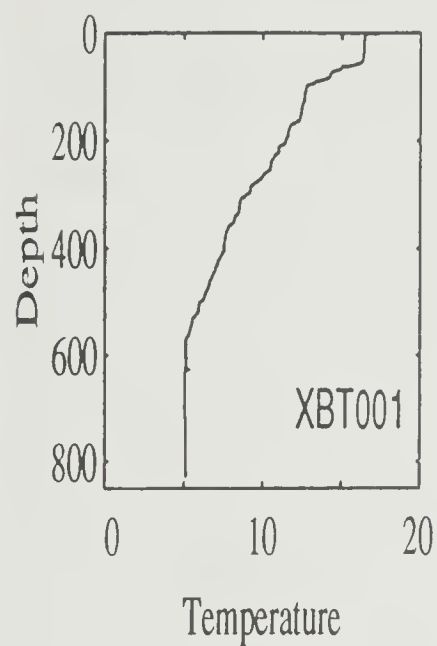
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31	30°27.97'S	03°42.98'E	11/1/93	8:15	19.0
32	30°42.21'S	03°58.76'E	11/1/93	10:04	18.8
33	30°56.79'S	04°16.02'E	11/1/93	11:57	18.2
34	31°10.34'S	04°32.49'E	11/1/93	13:46	n/a
35	31°24.88'S	04°50:40'E	11/1/93	15:47	18.4
36	31°38.11'S	05°07.13'E	11/1/93	17:28	18.3
37	32°18.62'S	05°55.53'E	11/1/93	22:34	18.1
38	31°51.11'S	05°21.53'E	11/1/93	19:03	18.2
39	32°45.56'S	06°28.59'E	11/2/93	1:52	18.0
40	33°00.55'S	06°47.00'E	11/2/93	3:48	17.7
41	33°13.99'S	07°03.03'E	11/2/93	5:28	17.7
42	33°27.98'S	07°20.54'E	11/2/93	7:15	17.7
43	33°41.04'S	07°36.74'E	11/2/93	8:51	17.8
44	33°54.60'S	07°53.89'E	11/2/93	10:31	17.8
45	34°09.15'S	08°11.00'E	11/2/93	12:11	17.6
46	34°24.04'S	08°27.80'E	11/2/93	14:02	17.7
47	34°36.95'S	08°42.53'E	11/2/93	15:27	17.6
48	34°52.80'S	08°59.49'E	11/2/93	17:22	16.6
49	35°08.31'S	09°16.22'E	11/2/93	19:25	17.0
50	35°37.69'S	09°48.50'E	11/2/93	23:26	16.5
51	35°52.34'S	10°04.28'E	11/3/93	1:25	16.6
52	36°06.84'S	10°20.44'E	11/3/93	3:18	16.0
53	36°22.79'S	10°37.02'E	11/3/93	5:19	16.0
54	36°35'90'S	10°52.48'E	11/3/93	7:17	16.4
55	36°43.72'S	10°34.69'E	11/3/93	9:50	16.4
56	36°45.96'S	10°23.07'E	11/3/93	10:52	16.5
57	36°47.96'S	10°12.11'E	11/3/93	11:51	16.5
58	36°37.38'S	10°21.03'E	11/3/93	13:35	16.5
59	36°23.89'S	10°38.33'E	11/3/93	15:21	16.1
60	36°18.17'S	10°46.33'E	11/3/93	17:19	16.0
61	36°10.65'S	10°55.46'E	11/3/93	18:19	15.66
62	36°02.83'S	11°04.51'E	11/3/93	19:20	15.4



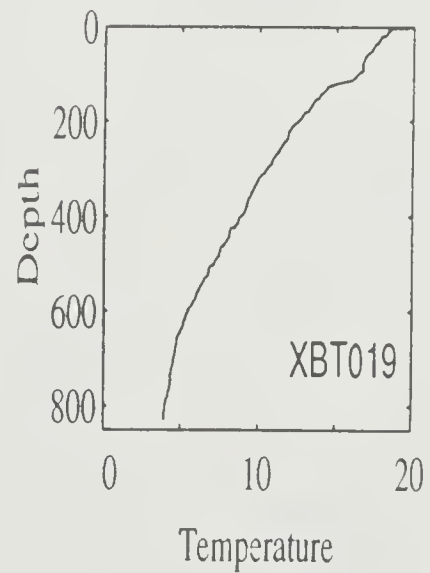
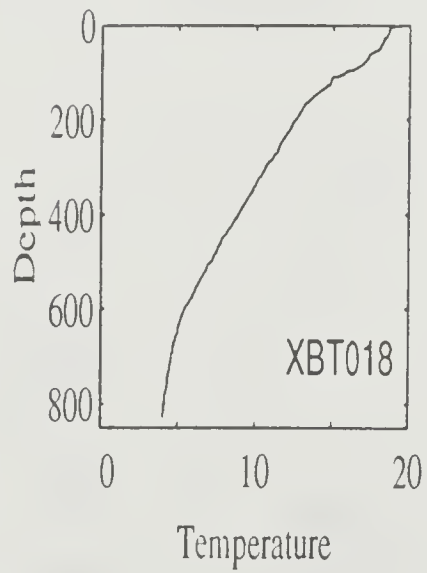
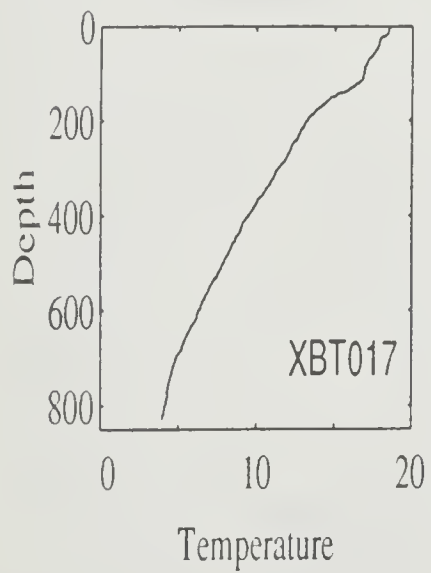
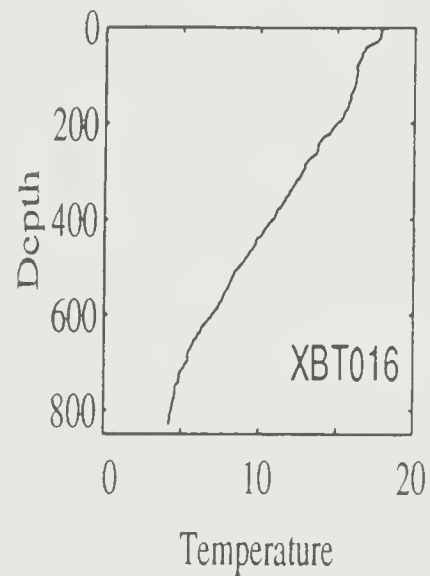
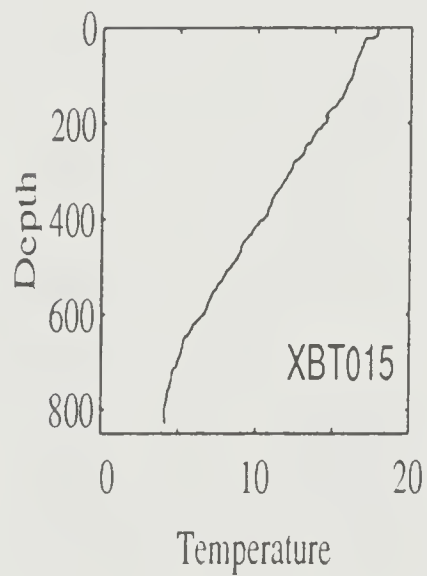
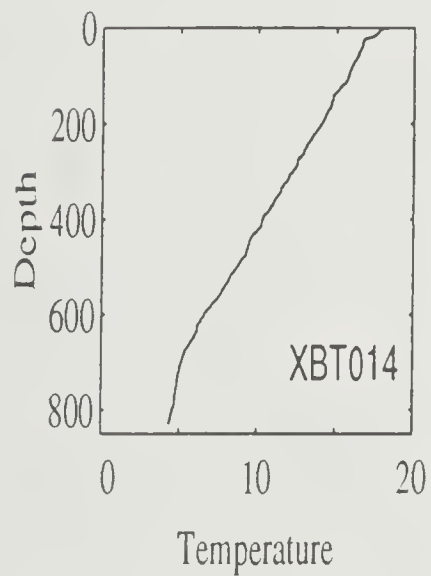
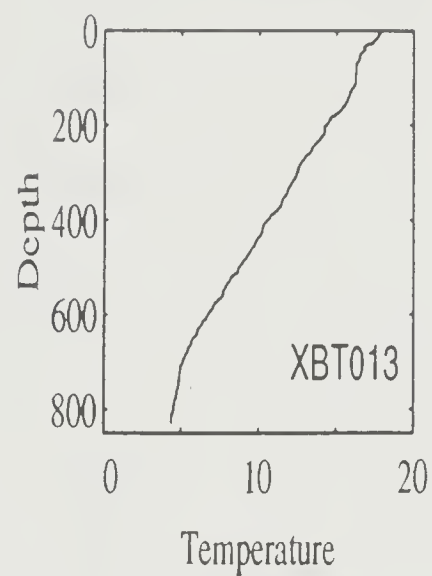
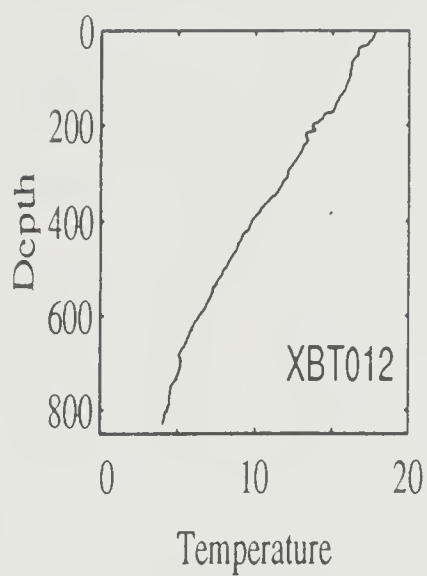
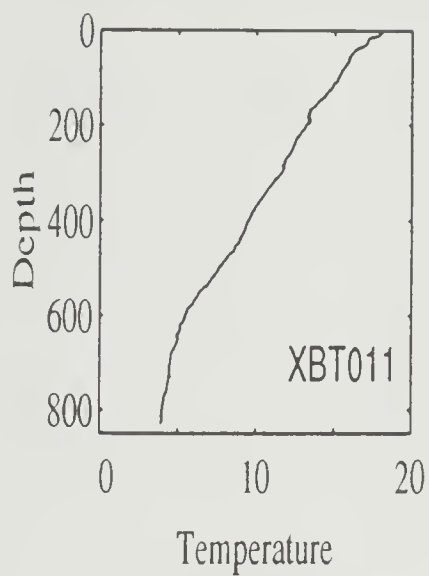
63	35°56.34'S	11°12.45'E	11/3/93	20:11	15.8
64	35°49.13'S	11°21.85'E	11/3/93	21:11	16.2
65	35°42.23'S	11°30.85'E	11/3/93	22:06	15.9
66	35°35.40'S	11°40.93'E	11/3/93	23:07	15.6
67	35°36.10'S	11°27.28'E	11/4/93	0:24	15.8
68	35°36.93'S	11°15.20'E	11/4/93	1:16	15.8
69	35°37.92'S	11°01.10'E	11/4/93	2:32	16.2
70	35°38.66'S	10°47.90'E	11/4/93	3:19	16.1
71	35°58.16'S	10°53.25'E	11/4/93	10:13	n/a
72	36°10.85'S	11°08.60'E	11/4/93	13:16	16.3
73	36°22.24'S	11°23.25'E	11/4/93	16:14	16.2
74	36°39.19'S	11°42.48'E	11/4/93	19:54	16.0
75	36°44.16'S	11°48.94'E	11/4/93	20:33	15.7
76	37°04.66'S	11°53.57'E	11/4/93	22:33	16.1
77	37°23.74'S	11°57.73'E	11/5/93	0:34	13.4
78	37°29.22'S	12°12.50'E	11/5/93	6:37	13.5
79	37°19.59'S	12°29.39'E	11/5/93	14:00	14.0
80	37°07.49'S	12°50.17'E	11/5/93	20:35	16.9
81	36°55.27'S	13°08.79'E	11/6/93	1:56	16.4
82	36°48.66'S	13°20.04'E	11/6/93	2:57	16.4
83	36°41.56'S	13°31.13'E	11/6/93	4:01	16.5
84	36°27.84'S	13°53.44'E	11/6/93	23:35	19.3
85	36°11.43'S	14°18.69'E	11/7/93	5:56	19.3
86	35°52.54'S	14°48.10'E	11/7/93	12:17	19.5
87	35°34.51'S	15°15.75'E	11/8/93	0:32	19.7
88	35°21.92'S	15°39.16'E	11/8/93	6:02	19.5
89	36°06.11'S	16°00.84'E	11/8/93	12:11	18.9
90	36°06.11'S	16°00.84'E	11/8/93	12:12	18.9
91	34°51.25'S	16°24.67'E	11/9/93	2:57	17.9
92	34°35.82'S	16°48.65'E	11/9/93	12:37	18.1
93	34°22.80'S	17°09.50'E	11/9/93	16:43	19.5



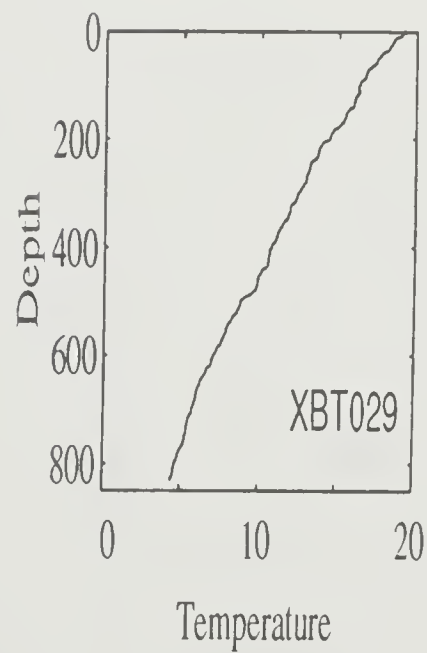
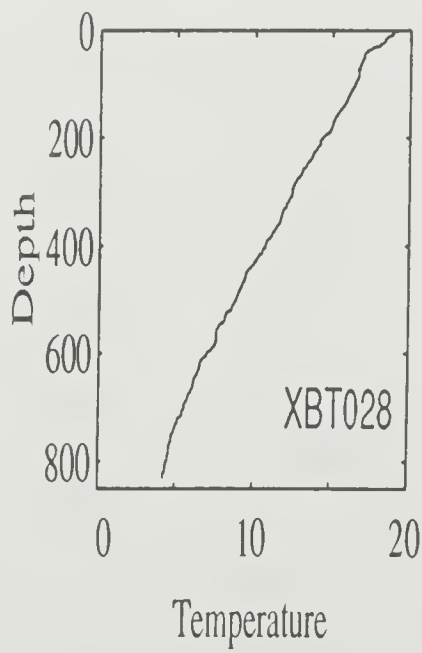
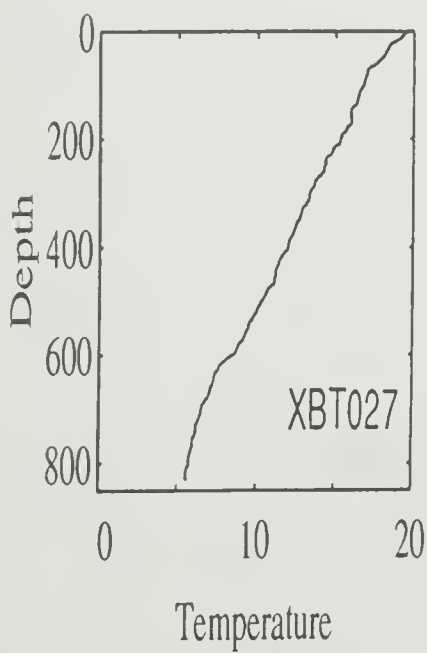
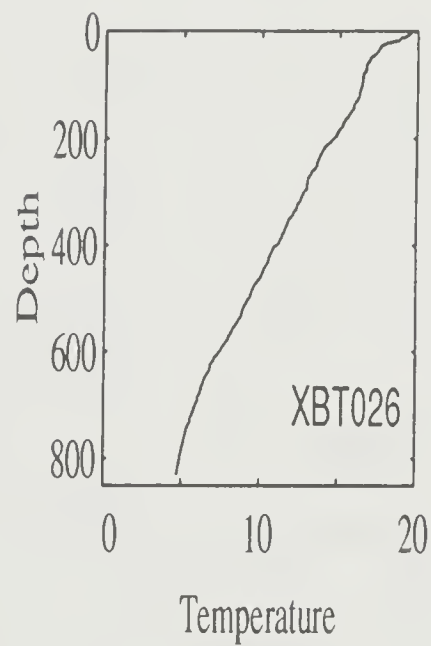
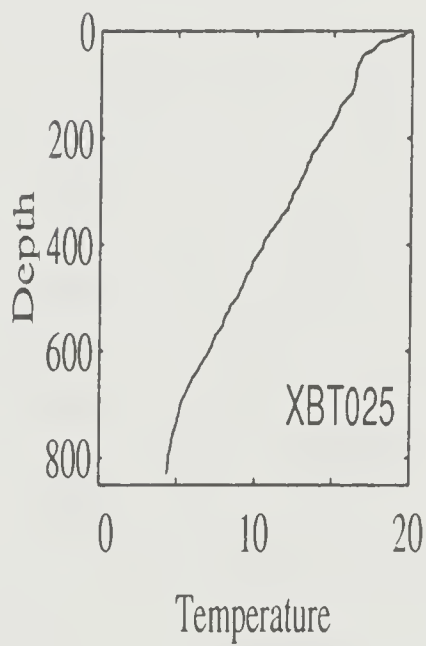
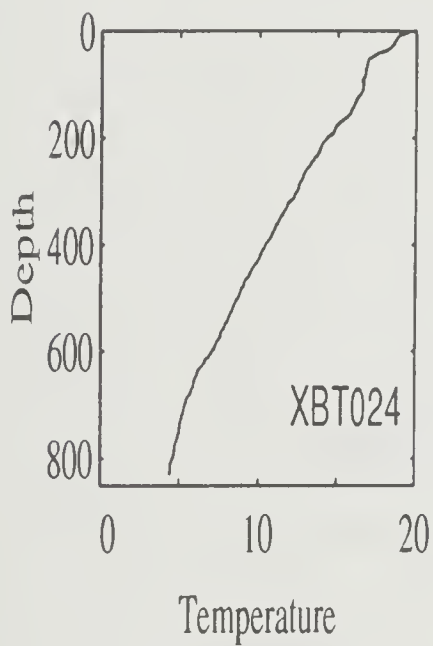
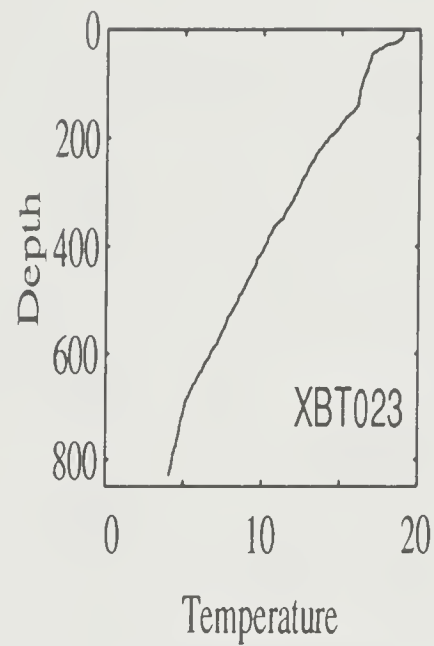
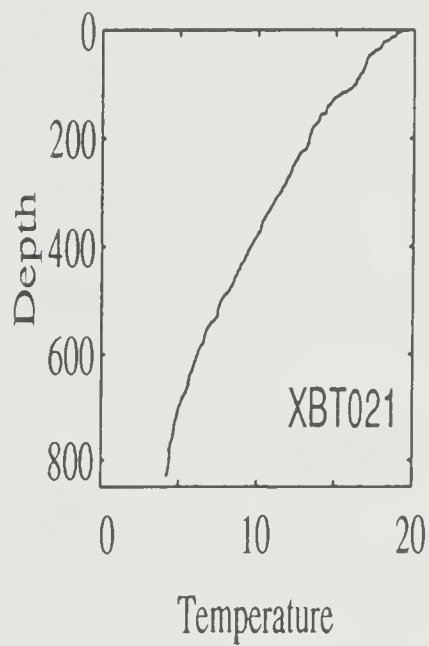
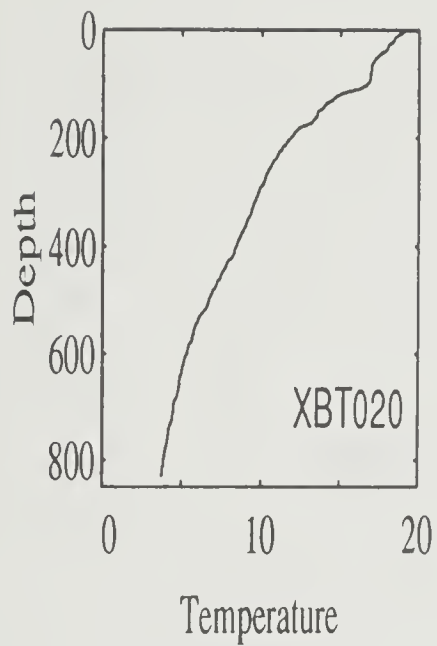




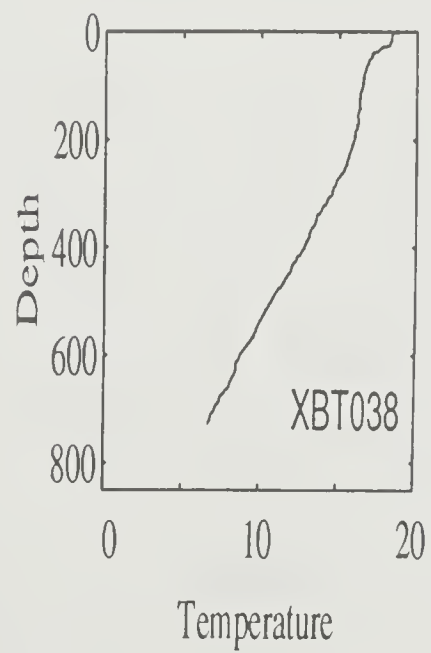
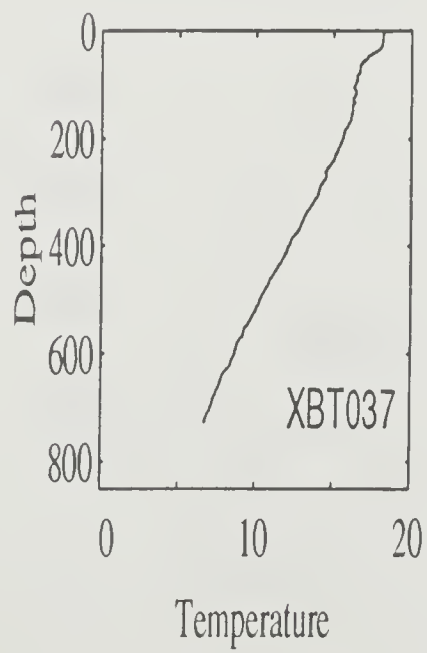
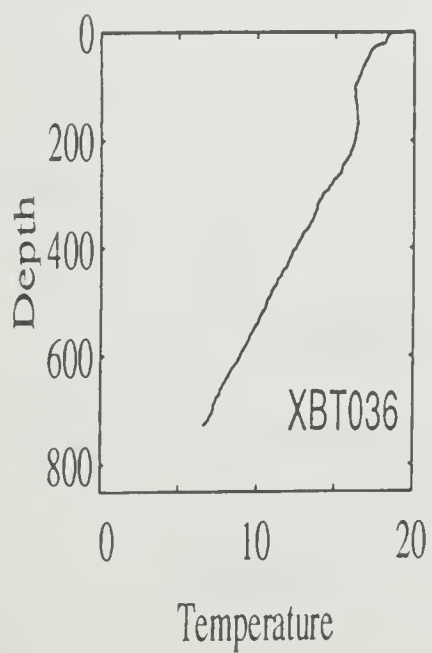
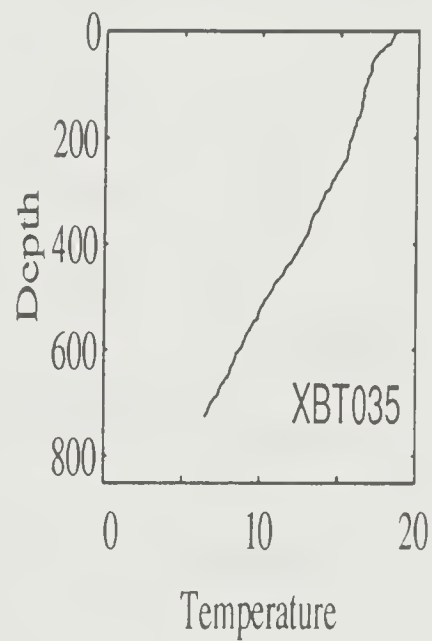
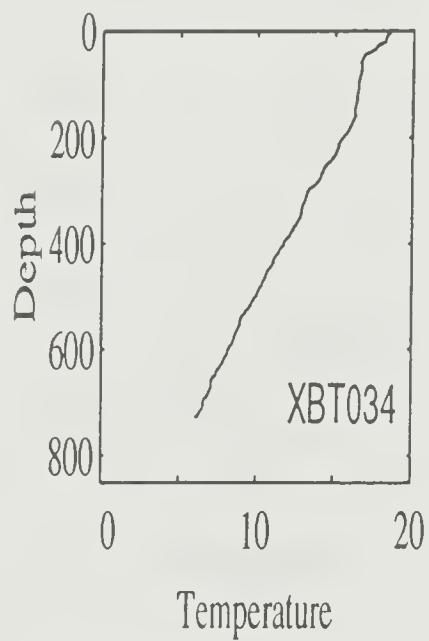
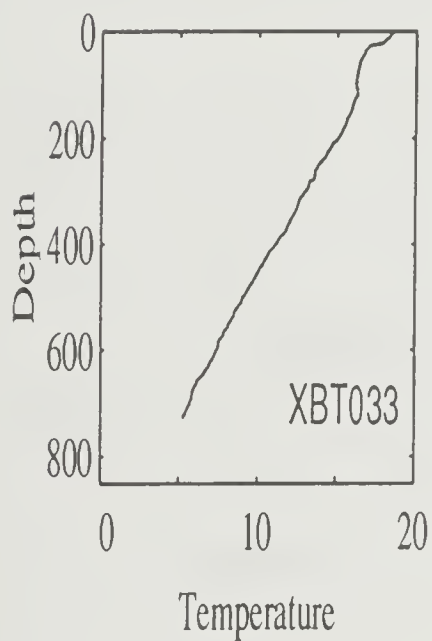
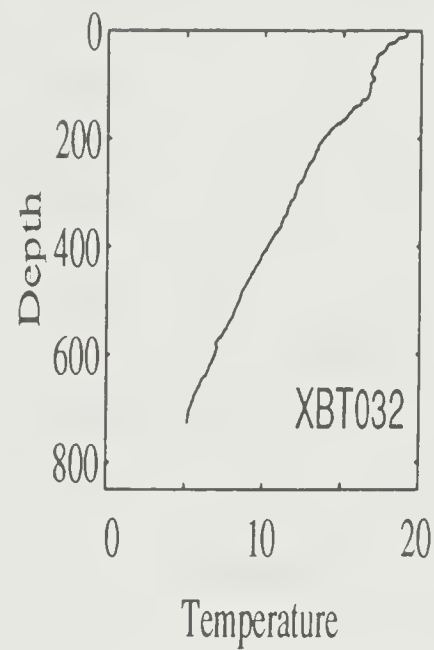
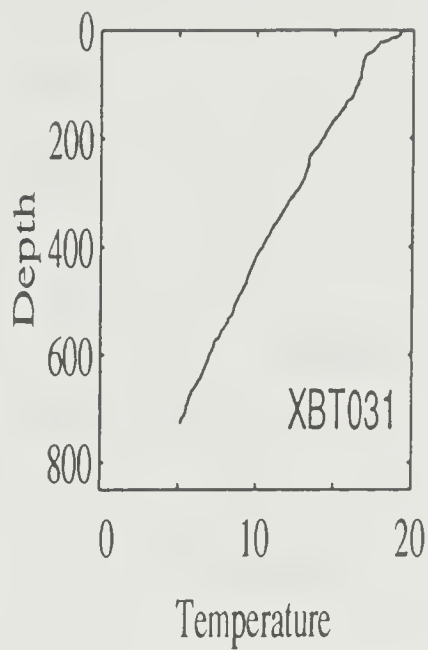
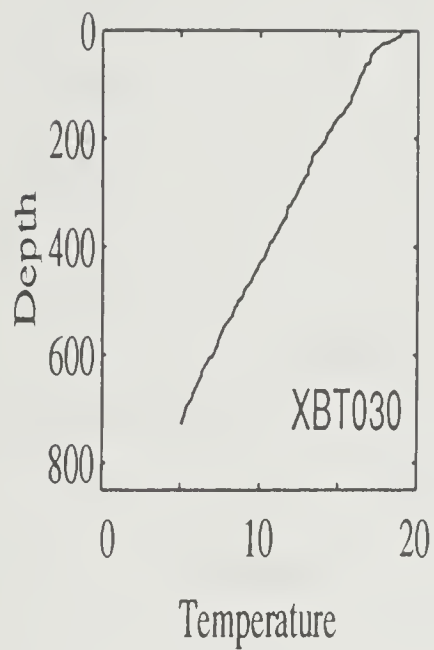






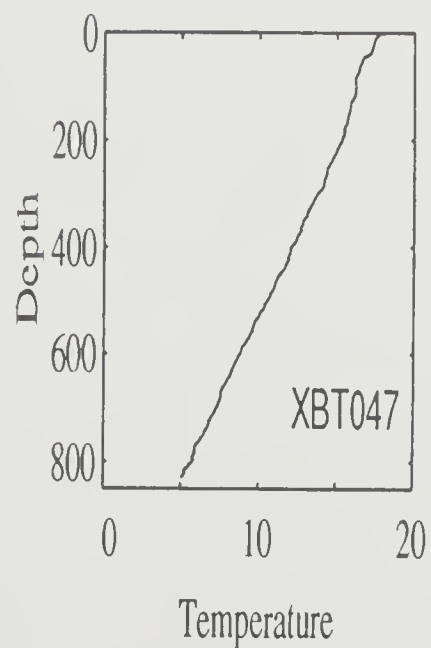
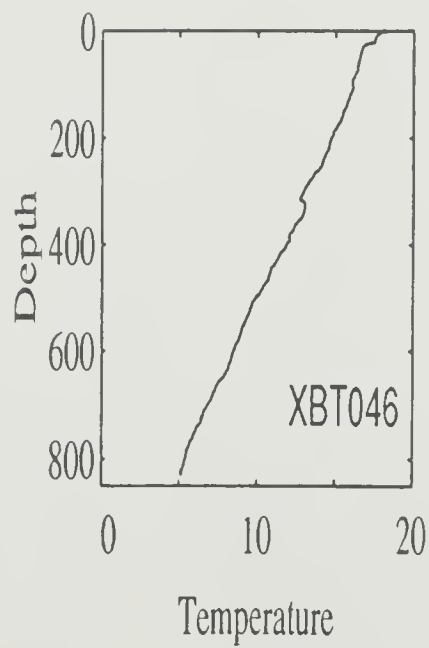
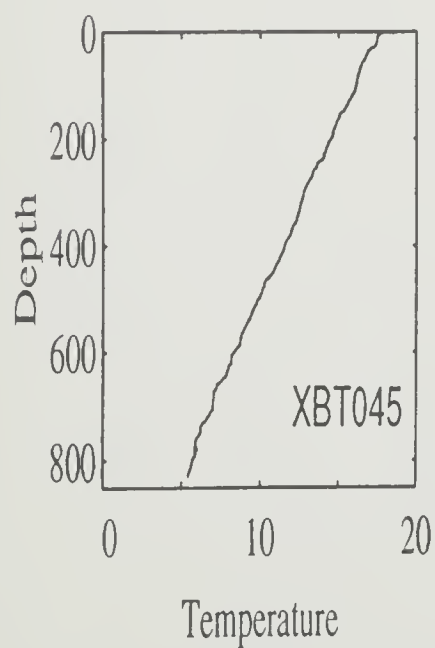
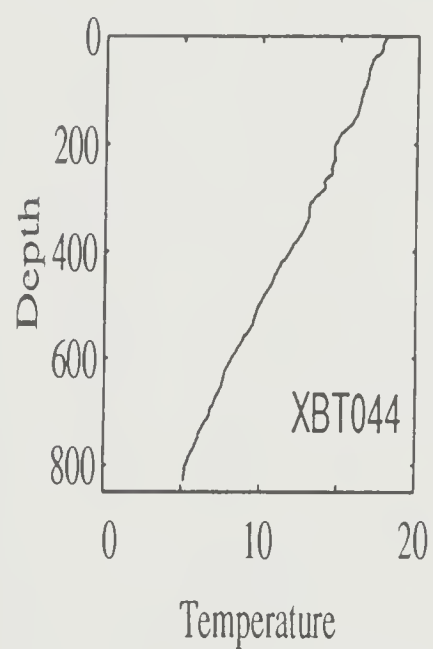
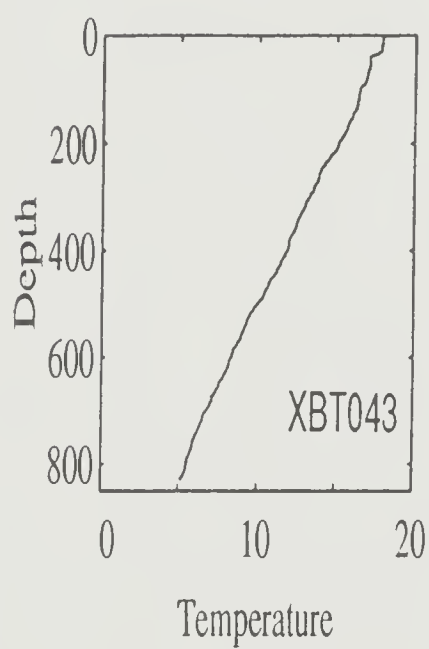
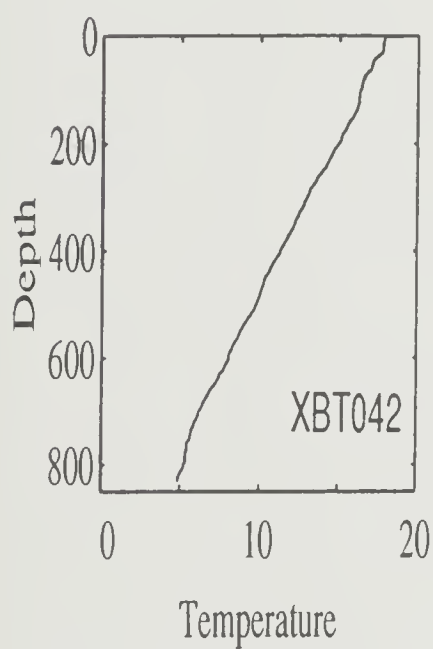
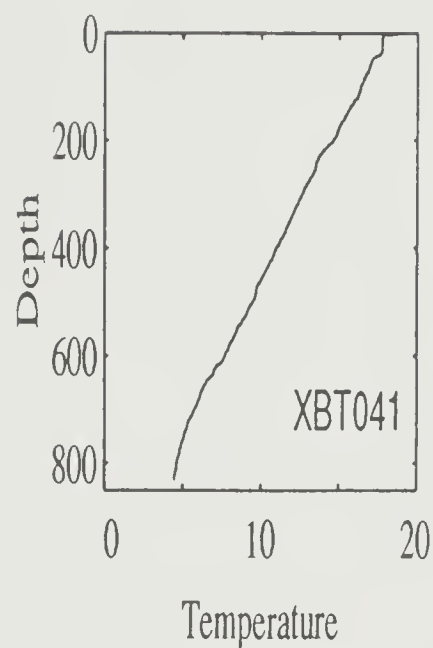
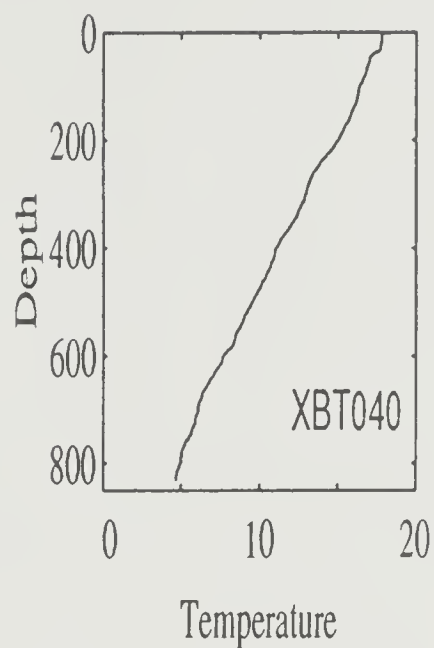
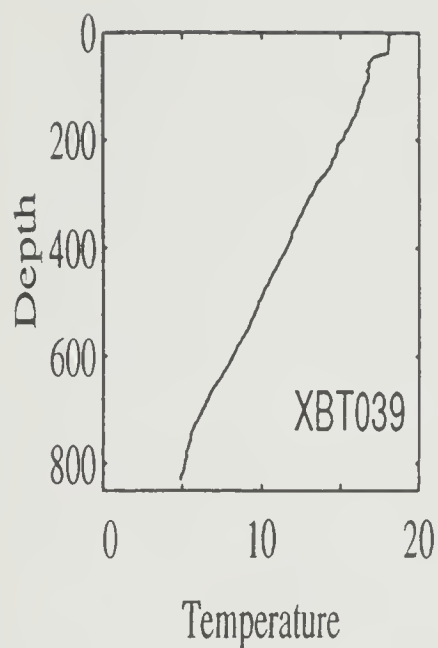




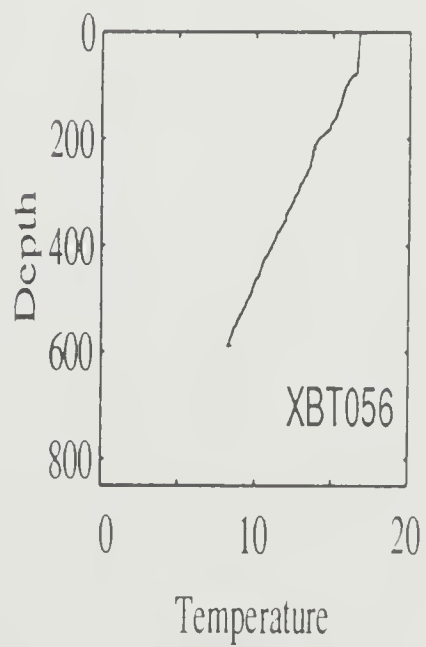
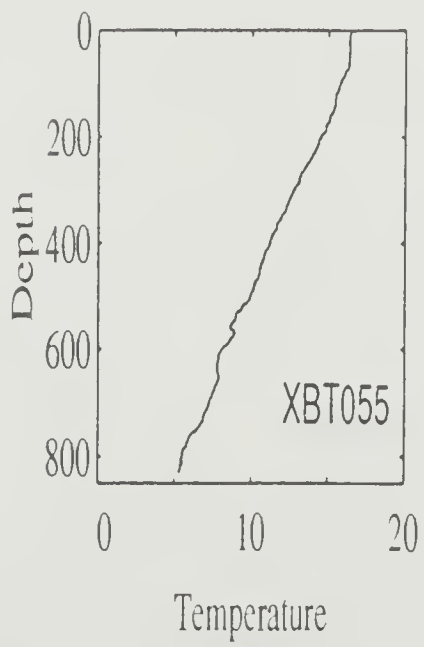
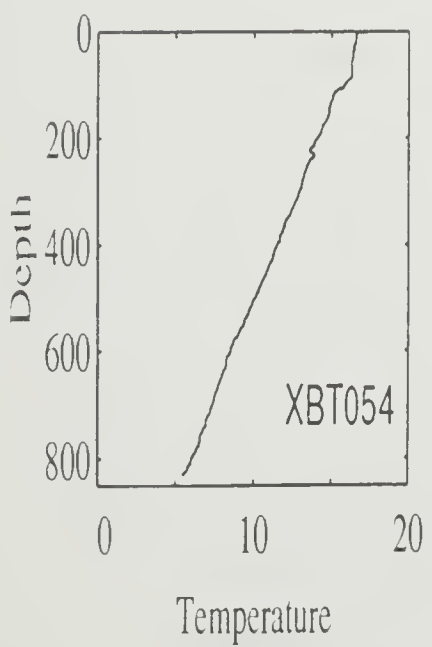
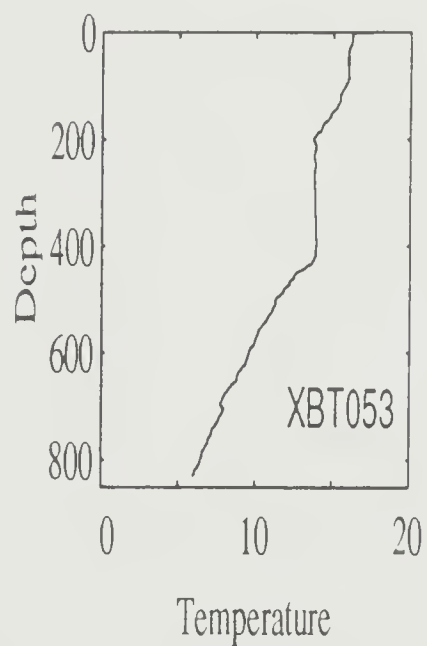
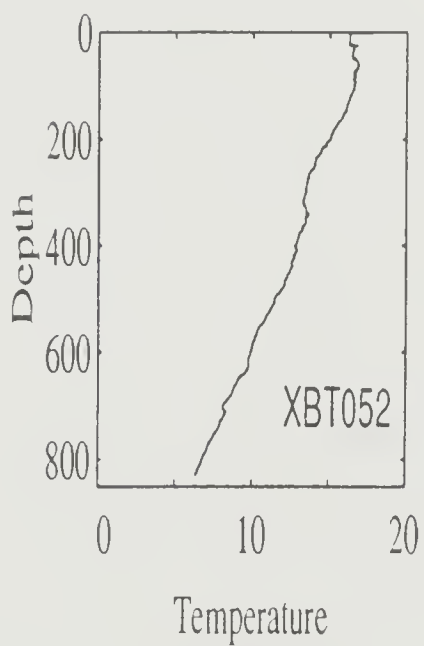
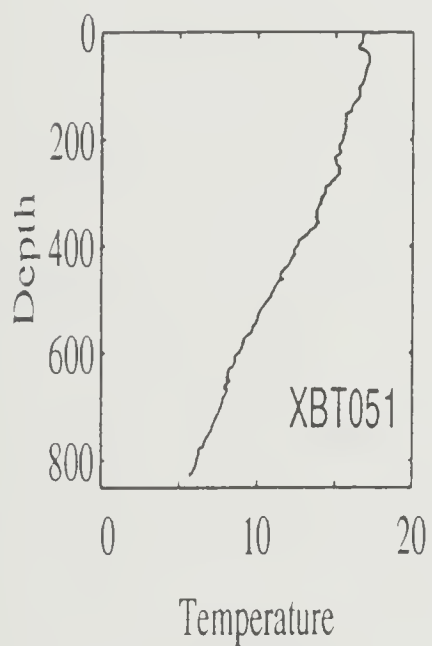
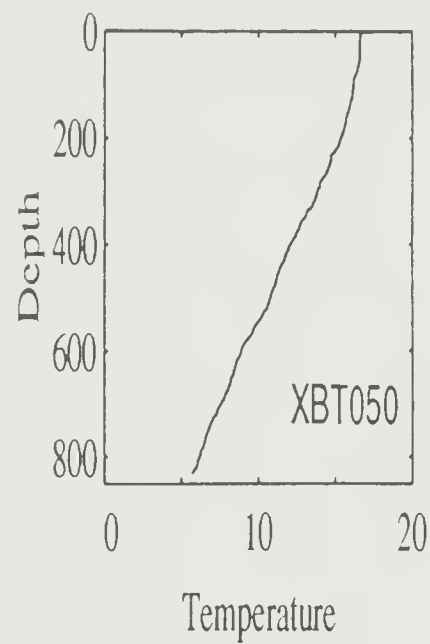
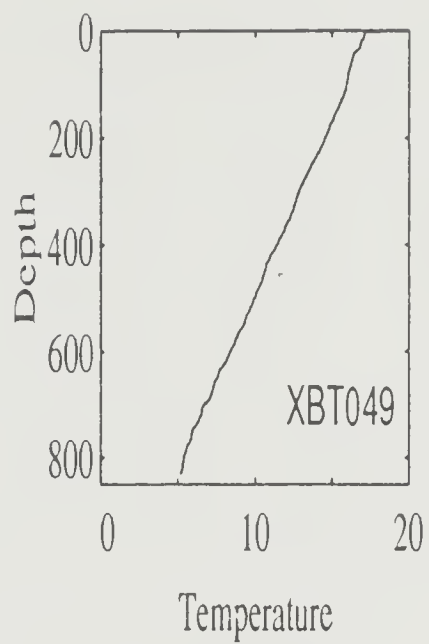
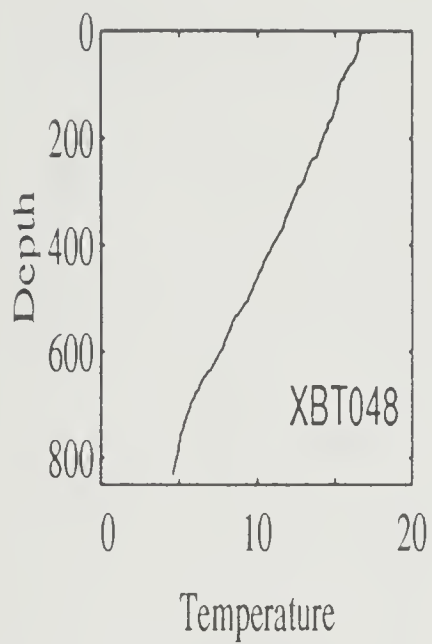




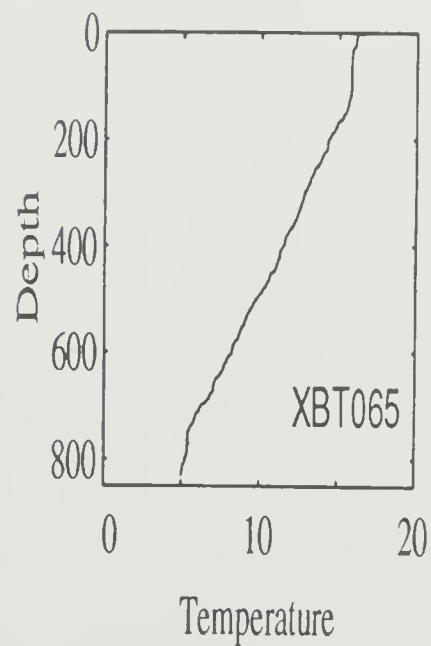
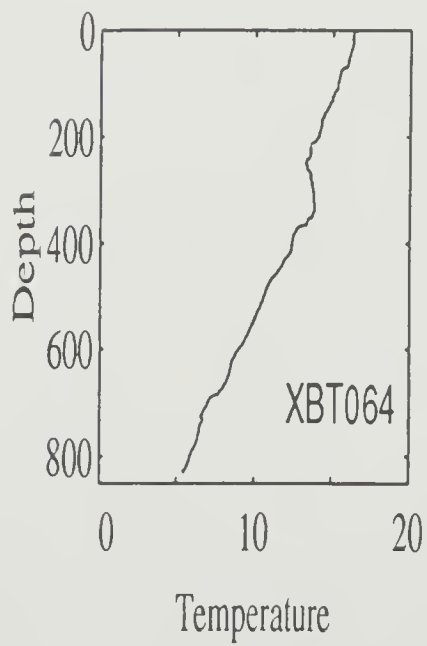
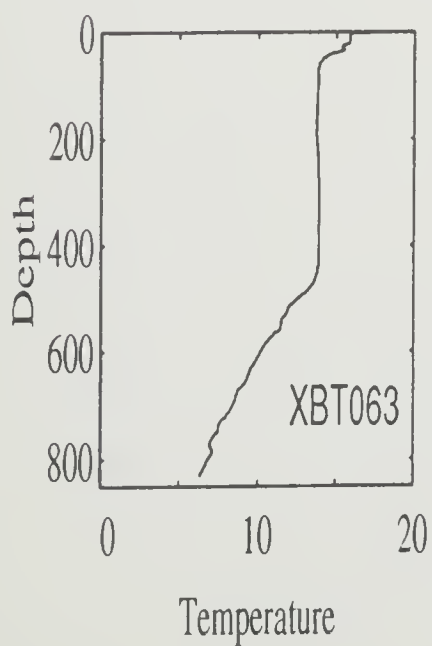
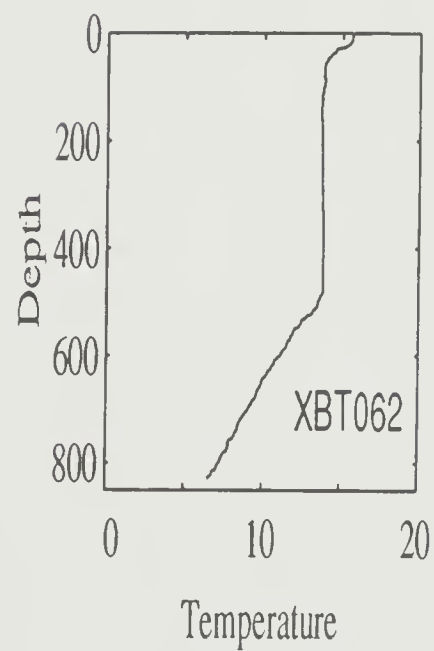
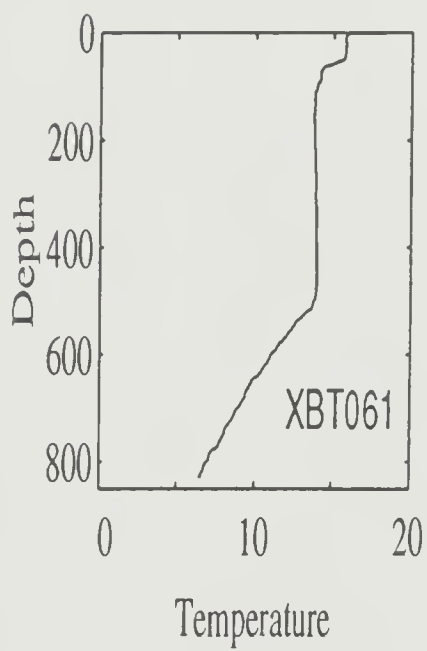
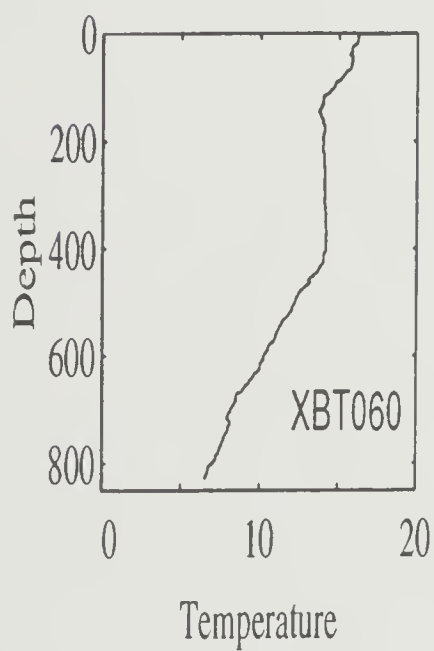
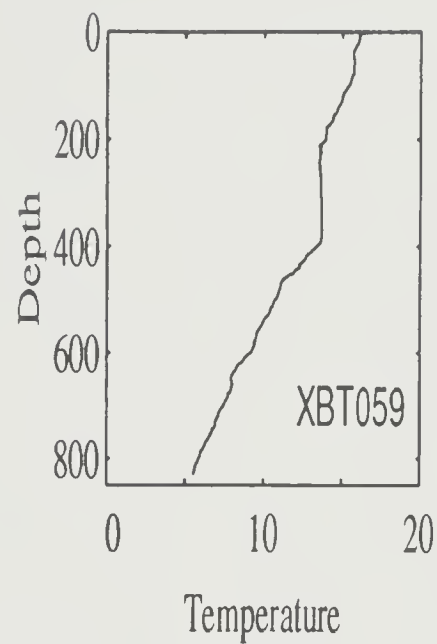
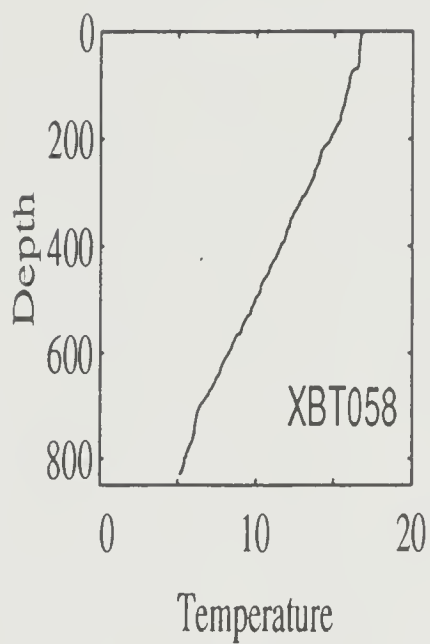
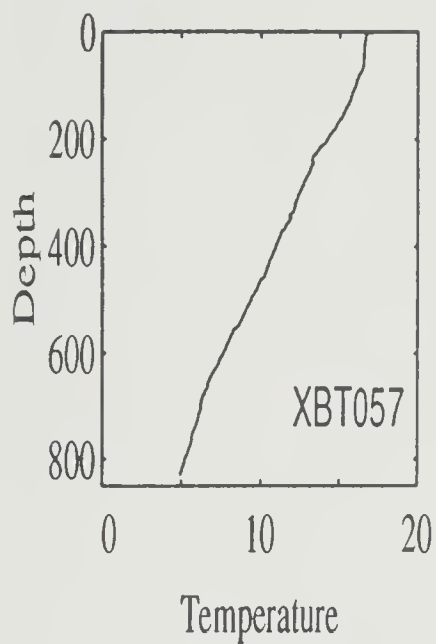




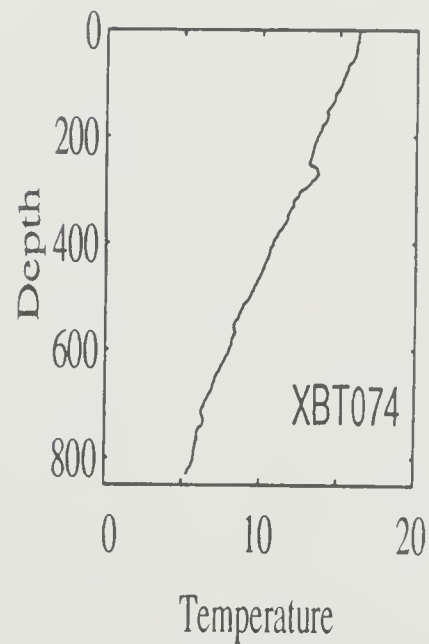
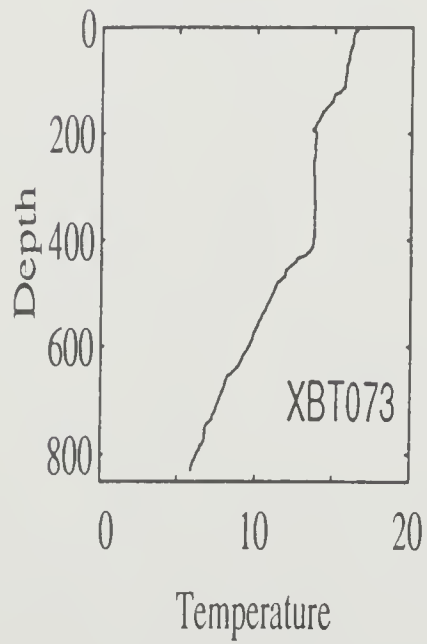
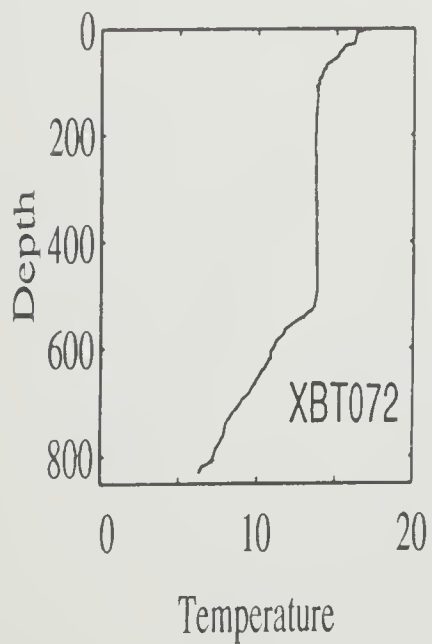
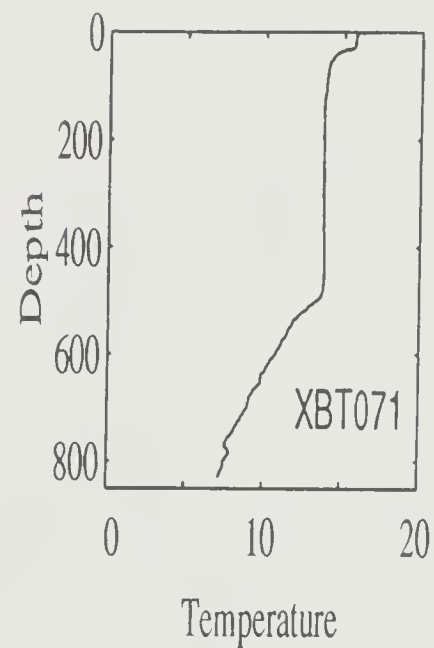
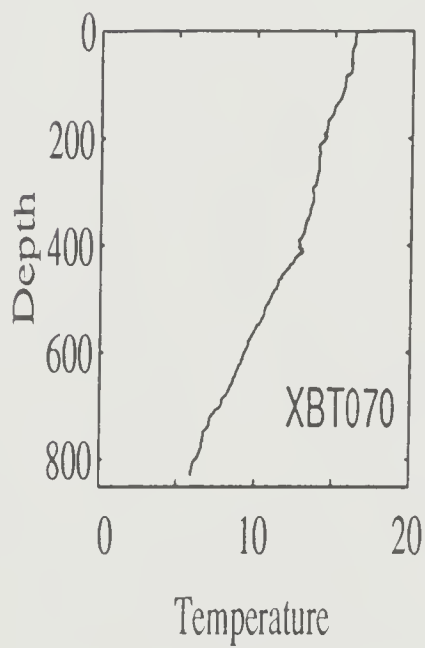
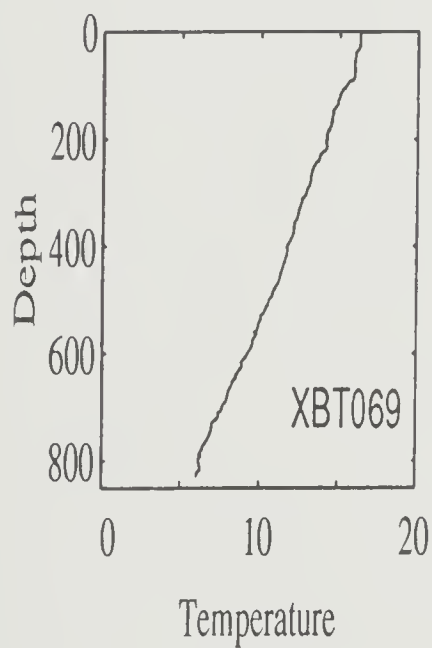
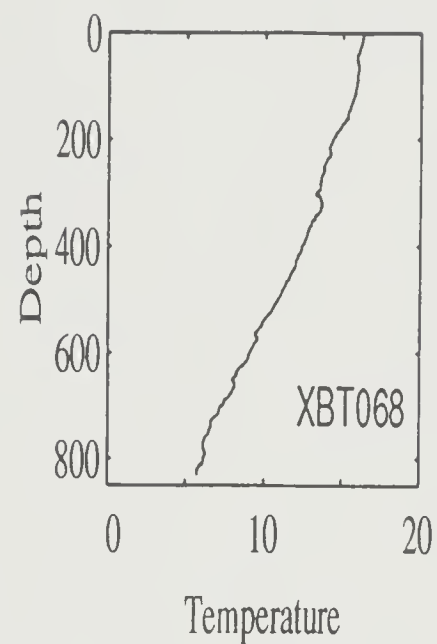
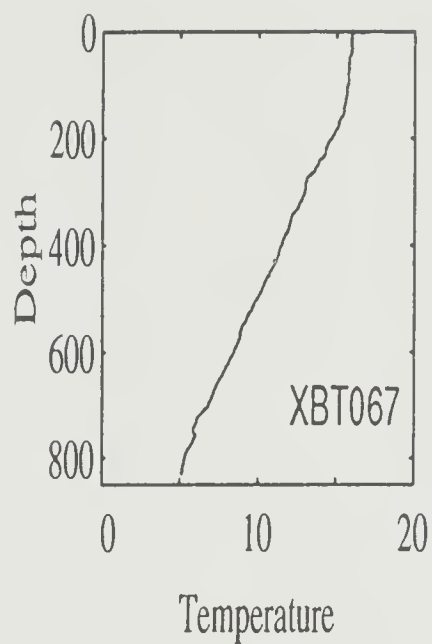
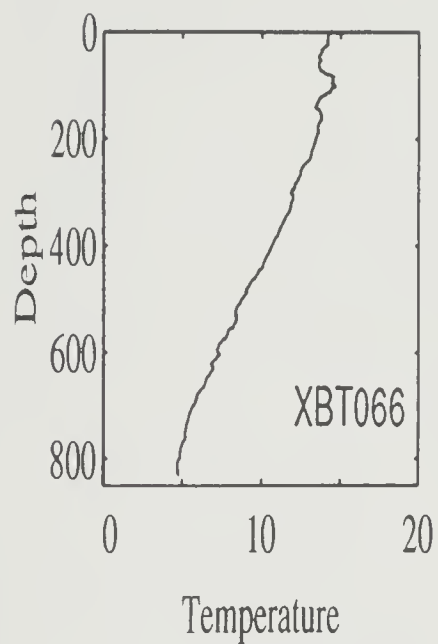






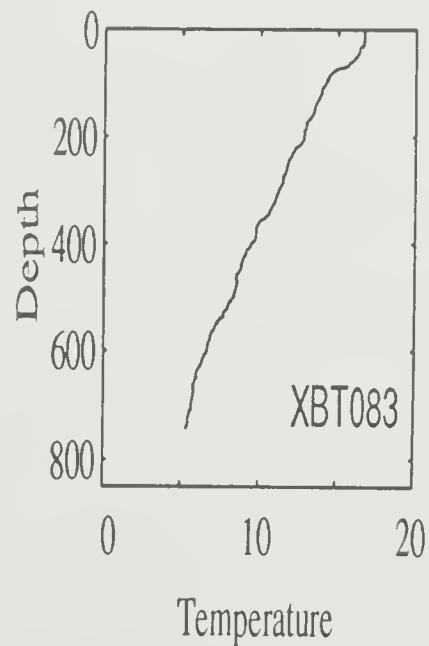
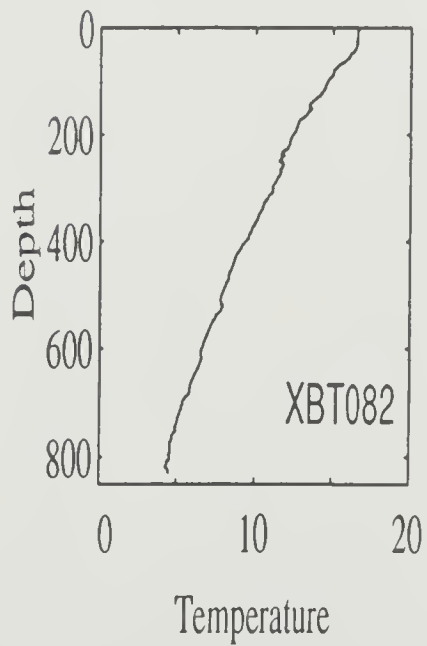
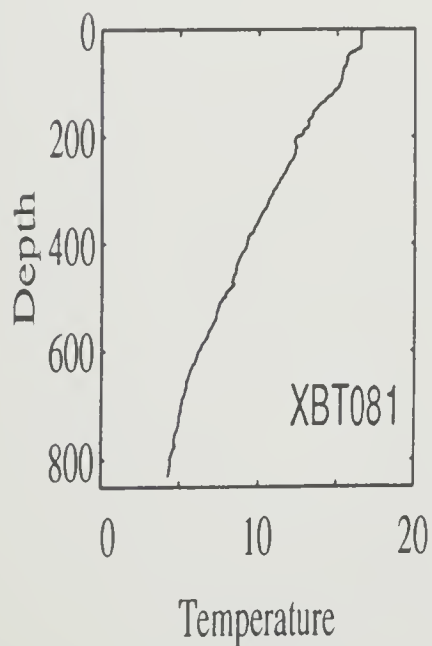
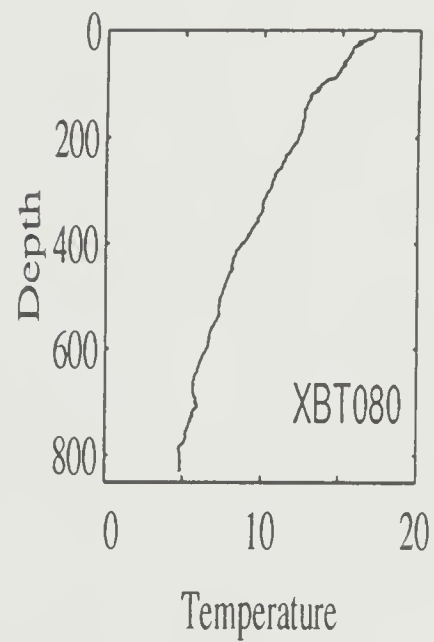
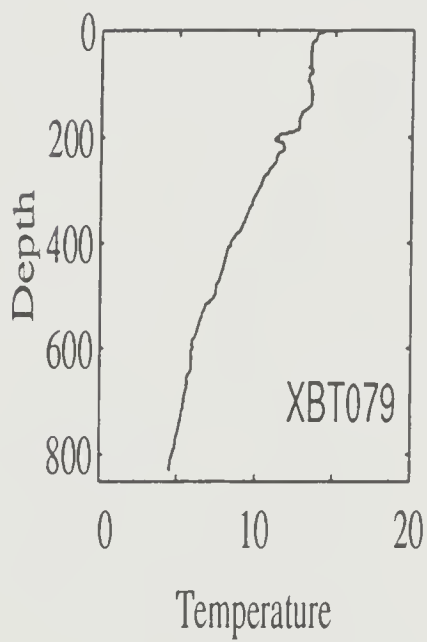
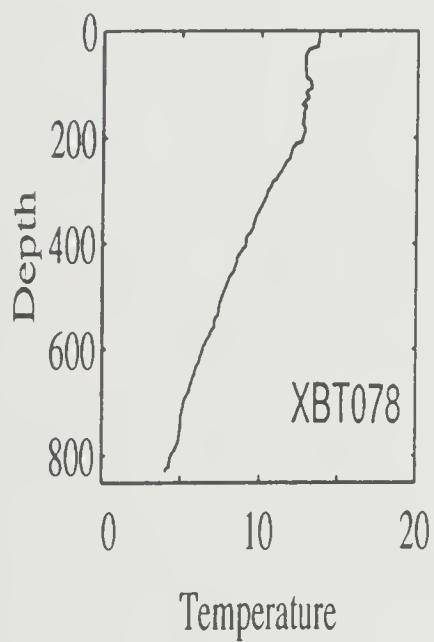
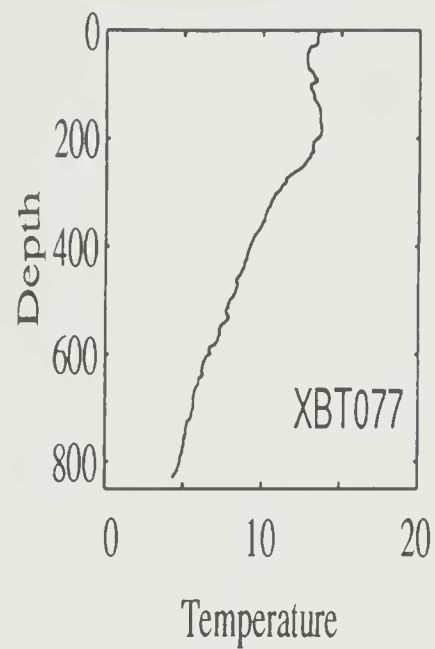
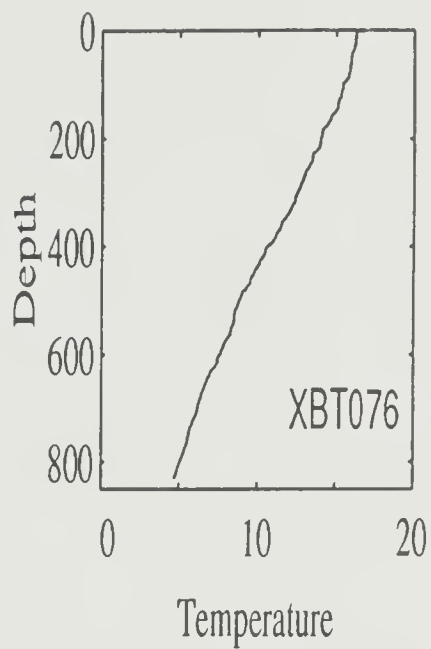
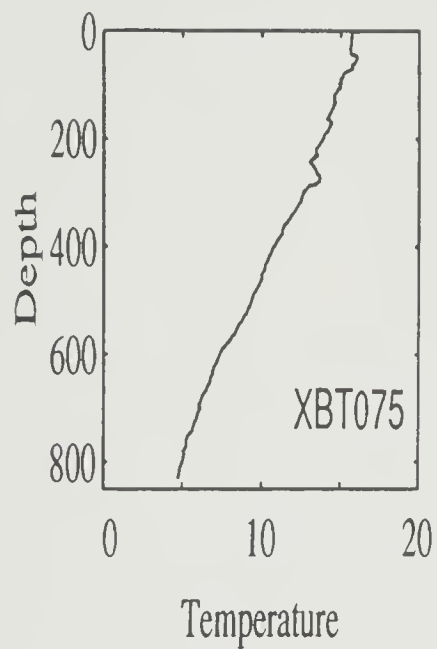




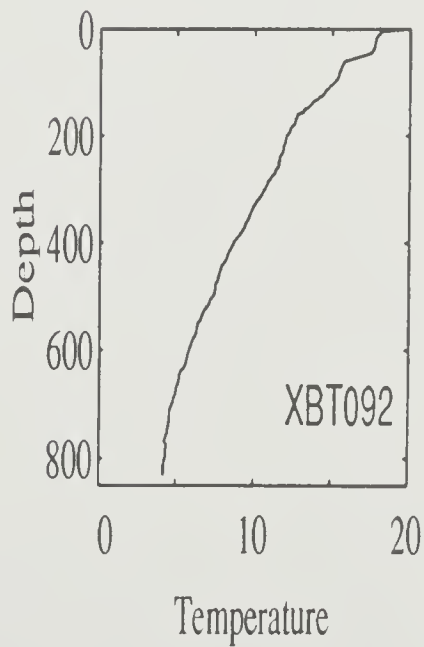
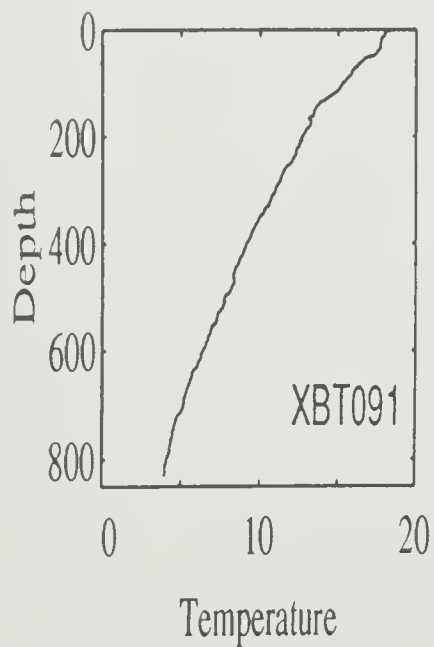
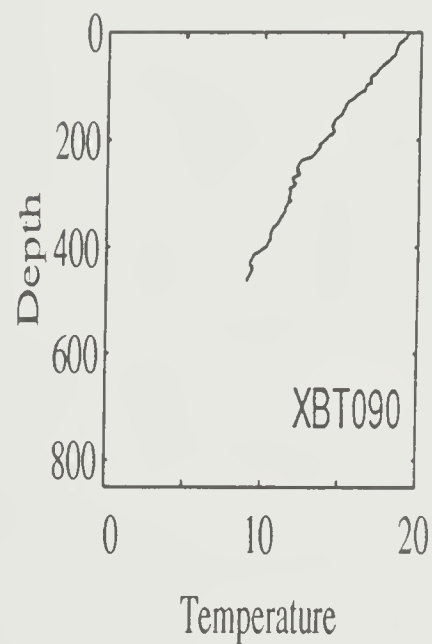
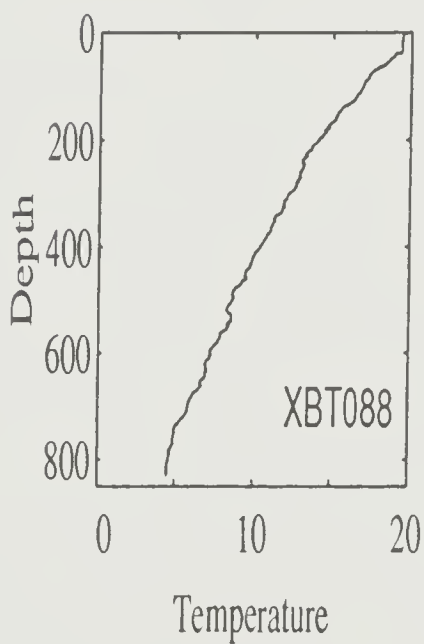
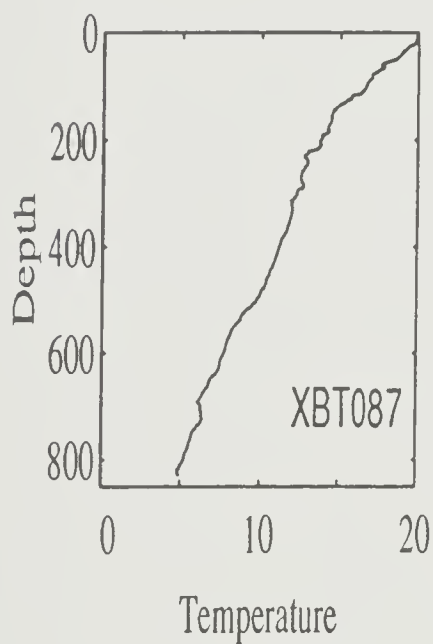
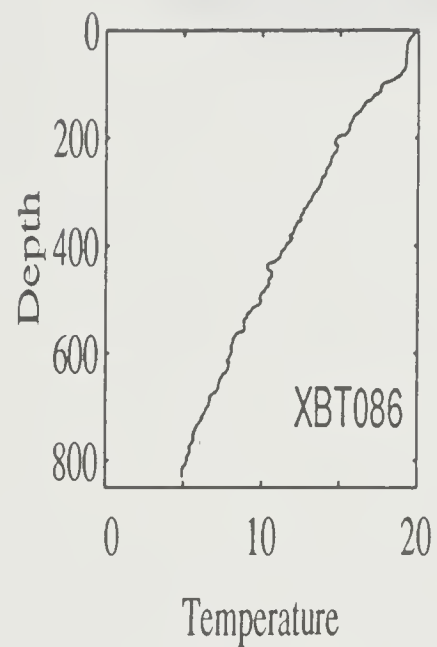
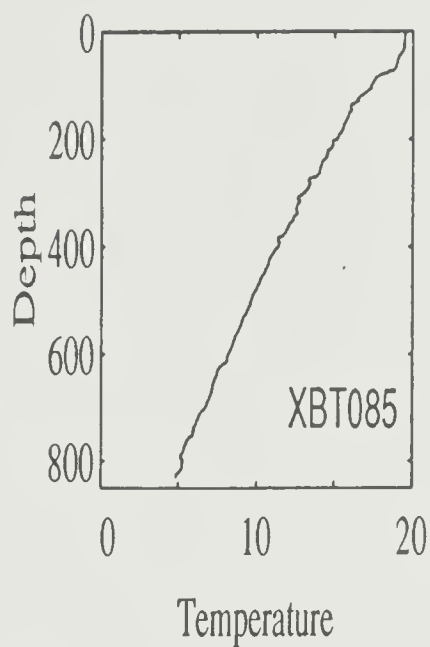
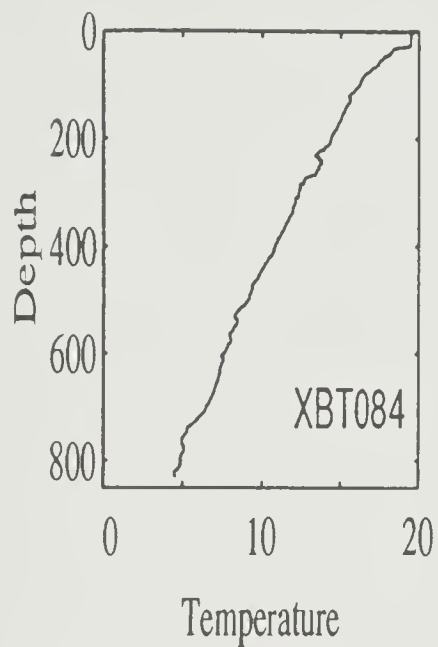














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